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MELANOSARCOMA OF THE IRIS

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The subject of malignancy is not new, but there can be no question that there seems to be an increase in this terrible affliction. In the clinics at the New York Eye and Ear Infirmary melanosarcomata of the uveal tract are by no means rare, but a similar condition affecting the iris is of rather unusual occurrence. It is for this reason that I feel justified in reporting these cases.

Because of the frequency of melanotic sarcoma, the subject of melanosis in ophthalmic literature has of late attracted increased attention, especially in its relation to general metabolism and to the normal functions both of the skin and eyeball. Melanomata, pigmented nevi or moles are either developmental defects or acquired new formations which, for a time benign, undergo slow changes ending in malignant disease. The melanotic pigment, melanin, is now recognized not merely as a side product but is thought to be connected with disturbances of cell metabolism. Localized in special cells, and apparently benign, this pigment seems at times to take some part in the development of malignant extension. Melanotic affections which commence in the eyelids and conjunctiva—extraocular melanomas—present characteristics similar to melanomas of the skin. They are amenable to the same treatment; that is, excision and treatment with radium and the X ray. Intraocular melanotic sarcomata are often beyond the control of surgery once metastasis has actually begun. The removal of the affected eye often does not prevent the individual from ultimately dying of this affliction. The possibility of distinguishing a disturbance of intraocular pigmentation from an intraocular melanoma changing slowly into a melanotic growth is a consideration from a clinical point of view, and some forms of therapy or surgery present the only hope of preserving the eye and of preventing extraocular extension. There are about 175 cases of iris sarcomata on record and these growths may be pigmented or unpigmented. Of the pigmented group some definitely start in large pigmented nevi which have been noted previously, and there are others which may have started in the stroma of the iris and may have had their origin from small nevi which, being deeply seated, escaped notice. Most of the tumors consist of large spindle cells, and these spindle cells are characteristic of growths derived from nevi.

Melanosarcoma of the iris is most frequent between the ages of 35 and 55 years, and according to statistics is of more frequent occurrence in females than in males. The lower half of the iris is also more frequently affected than the upper. It is difficult to state whether the tumor starts at the root of the iris or in the neighborhood of the ligamentum pectinatum, since these structures usually become rapidly involved with the growth. The beginning of these tumors presents varying clinical appearances which are in all probability due to the site of their origin. In a defi-

nite pigmented nevus the extension is noted by an increase in the size of the tumor, whereas if starting in the deeper layers of the iris near its root the growth may spread beneath the stroma and cause varying discolorations which vary from a light yellow to a brown or brownish black. These growths have a tendency to metastasize into the fibers of the ligamentum pectinatum and canal of Schlemm, giving rise to increases in tension. In some cases the tendency for the growth to metastasize around the angle of the anterior chamber produces a type of growth known as ring sarcomata of the iris. These cases have been recorded by Werner,[1] Parsons,[2] Li,[3] and others.

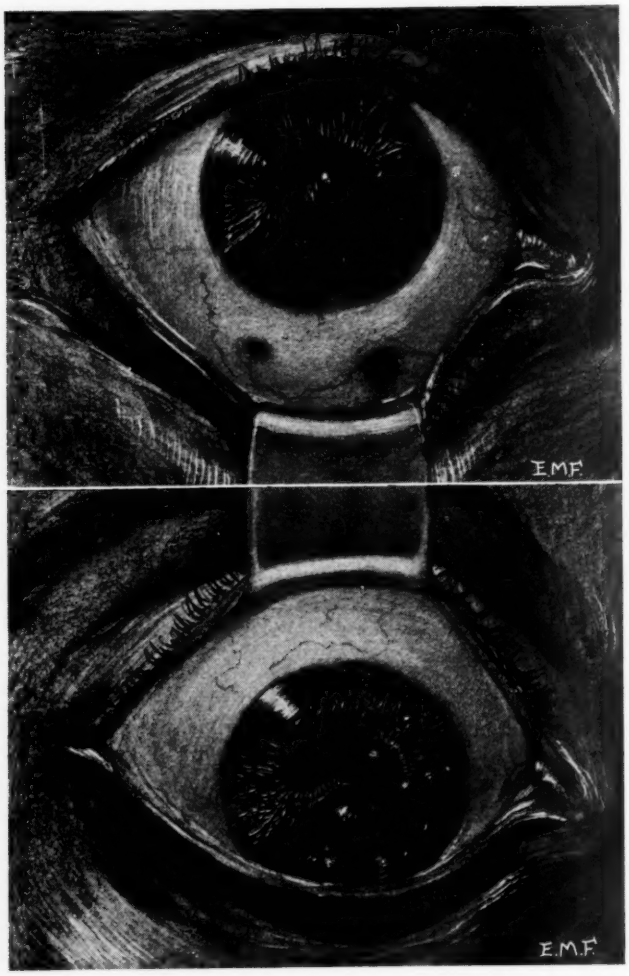

Fig. 1 (Doherty). Case 1, showing lobes of the tumor. Notice small white area in lower part of mass, and pigment spots on sclera.

Case 1. Melanosarcoma of the iris starting from a benign nevus. G. W., aged 35 years, an Italian with dark complexion, stated that as a child he had always noted a dark pigmented spot on the colored part of his right eye and that he was equally sure that the two pigmented areas on the sclera near the exit of the anterior ciliary vessels were also present as long as he could remember. From his description there could be no doubt but that from early childhood he had had a well-marked melanoma of the iris with two melanotic patches on the sclera below. He experienced no trouble with his eyes until four months previous to his visit to the clinic at the New York Eye and Ear Infirmary, his only discomfort being a gradual loss of vision with no pain. The drawings (fig. 1) well illustrate the ocular condition upon his arrival at the hospital. The whole tumor gives the impression of springing from a melanoma of the iris. It consists of five different areas which are worthy of description. 1. From the patient's statement the temporal side of the mass seemed to be the remains of the old melanoma which was of a cinnamon color. 2. A small round brownish-black colored mass could be seen projecting from behind the iris. 3. There was a large mass of prac-

tically the same color as the mass on the temporal side projecting anteriorly into the anterior chamber. 4. Below, was a larger lobule of the tumor, very much darker in color than any of the other lobes, in the lower part of which there was a small white area. 5. The nasal side of the growth was of the same color as the temporal side and consisted of a number of small lobules. The tension of the eye was 28 mm. Hg.

The patient was informed of his condition and advised to have the eye removed. He desired to consider the matter and returned again to the hospital in 10 days. His eye at this time presented an entirely different picture. He had considerable pain; the cornea was steamy; and a large hemorrhage was present in the anterior chamber. The tension of the eyeball was 56 mm. Hg. The two small melanotic spots in the sclera below disclosed a rather unusual picture. The anterior ciliary vessels were markedly engorged and the two isolated spots were distinctly raised and had the appearance of two small round black beads or two vessels that had been pumped full of black ink. Enucleation was again advised, to which the patient readily consented. The eyeball was removed under local anesthesia and a histological report of a section of the eye was made as follows:

The tumor occupied the region of the ciliary body. It had caused an iridodialysis in addition to replacing the iris on one side. Posteriorly it extended into the choroid for a distance of one centimeter. The cells were uniformly packed with brown or black pigment granules which were so abundant as to obscure their outlines. There were a number of blood vessels and large blood spaces scattered through the tumor. An examination of the depigmented slide revealed an outline of the cells. They were large, oval and round, and disposed in a diffuse manner. The pigment had been largely removed from the central area of the mass, but only partially from the extensions of the choroid and iris. In these locations the pigment occurred densest in the untreated preparations.

I am sorry that an examination of the urine for melanin was not made.

Case 2. I am reporting this case through the kindness of Dr. LeGrand H. Hardy of New York City whom I assisted at the operation in 1930. Mr. W. V., aged 60 years, complained of ocular fatigue upon reading and close work. His general medical history was negative, and there was no history of malignancy in any of his immediate family. He said that he knew he had a spot on the right iris but had absolutely no idea of its duration. Ex-

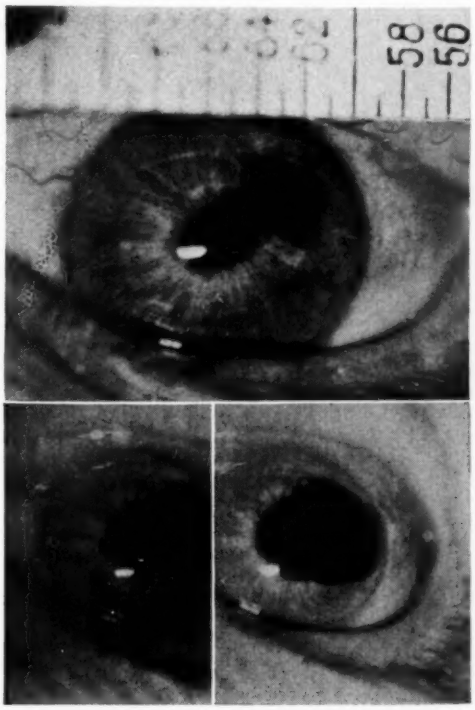

Fig. 2 (Doherty). Case 2. Above, showing appearance of tumor before operation. Below, showing appearance of iris after operation. Notice small area of growth on lower pillar.

amination of the right eye was negative in all respects with the exception that the pupil appeared slightly eccentric, pear-shaped, with the apex down and out. A 3-by-3-mm., partially pigmented mass was present at the pupillary border; by oblique illumination it was seen to be spherical and there were several small pigmented spots on the anterior capsule of the lens. The pupil reacted normally to light; the root of the iris seemed clear; the mass apparently was limited within the minor circle. The pupil dilated with atropine, and by transillumination the mass appeared to be partially cystic. The patient was informed of the seriousness of the condition and readily agreed to operative procedure.

Because of the location of the mass on the pupillary border of the iris it was first determined to remove it *in toto* and have it examined; then if it proved to be merely a cyst no further operative procedure would be necessary. The eye was operated on under local anesthesia at the New York Eye and Ear Infirmary, a wide keratome incision being made and extended below with the scissors. The tumor upon being grasped with iris forceps collapsed. The tissue retained within the forceps was withdrawn, pulled upward, and the lower pillar was cut; then downward, and the upper pillar cut; finally, stretching from the base, the root of the iris was severed. At the end of this procedure a pigment spot was seen remaining on the lower pillar. As the anterior chamber was collapsed and the mass appeared to be a cyst it was decided it would be wiser to wait for the pathologist's report rather than risk injuring the lens capsule. An iridectomy on the lower pillar was to be considered later.

The microscopical report on the tissue section was as follows: The specimen submitted consisted of interlacing bundles of oval and spindle cells. Certain areas revealed a considerable degree of pigmentation, the dark black granules being mostly intracellular. A number of small oval and round cavities were seen throughout the growth. They appeared to be cystic degenerations with walls of tumor cells. The mass was situated mostly on the anterior surface of the sphincter muscle. Vertices of the anterior limiting layer of the iris were visible. Posteriorly, the tumor cells had penetrated between the plate of connective tissue behind the sphincter, reducing it to cloudlike masses of hyalinized tissue. Moreover, the growth appeared to have proliferated around the pupillary area where it must have interposed itself between the iris and lens capsule. The two layers of pigmented cells were readily identified. At one point they seemed to have been separated from each other.

After studying the sections the pathologist advised enucleation. The tumor could apparently be removed *in toto,* but the lack of security and subsequent apprehension made enucleation advisable. The patient agreed that he would rather lose the eye in spite of its perfect vision than be anxiously on the watch for further occurrences. This procedure was carried out, and the lower pillar of the iris examined microscopically presented marked evidences of the original tumor.

Case 3. Seen in consultation with Dr. E. C. Hartman of Parkersburg, West Virginia. In March of 1930 I received a photograph from Dr. Hartman with the following history: Mrs. B. F. B., aged 42 years, had a negative family history. Her past history was irrelevant with the following exception. In 1925 for several months she had had severe headaches on the right side of the head. Dr. Joseph E. J. King of New York City performed a decompression operation and an exploration of the cortex of the brain, but found no pathology. The headache, however,

ceased after this operation. The patient had been married 20 years but had no children.

About 1926 the patient noticed a colored spot on the ciliary margin of the right eye which remained the same size for four years and then began to grow rapidly. The vision remained normal. The general physical examination was negative, the patient being a well-nourished white, adult female weighing 200 pounds; and her height was 67 inches.

From the appearance of the tumor this case seemed to be one of melanosarcoma of the iris and we both advised enucleation at once. This advice was proposed to the patient, who refused any operative procedure. The tumor continued to grow, and in October, 1931, her eye presented the following appearance: The original growth had increased in size until it was within a few millimeters of the pupillary border; there were also a number of islandlike extensions into the periphery of the iris, and with the slitlamp an almost perfect outline of the large and small vascular circles and some of the connecting branches could be made out. This picture presented itself as minute dots of brown powderlike pigment which were arranged as previously stated. These were situated either in the veins or in the lymphatics, but no definite vessel wall could be observed. The mass did not transilluminate, the tension was 28 mm. Hg, and the general clinical appearance now was that of a ring melanosarcoma of the iris. Dr. Hartman again advised enucleation, to which she consented.

The following is a report of the pathological examination made by Dr. Bernard Samuels at the Eno Laboratory of the New York Eye and Ear Infirmary: There was some shrinkage of the globe due to the fixation. The anterior stretches of the choroid, the entire ciliary body, and about one half of the iris were replaced on one side by a highly pigmented new growth. Externally the growth lay firmly on the sclera. It had infiltrated the ligamentum pectinatum and filled with Schlemm's canal. Toward the median line tumor cells were traced anteriorly to Descemet's membrane, to a point beyond the ring of Schwalbe. Extensions of the tumor occurred in the pupillary regions on the opposite side and in the root of the iris and the ligamentum pectinatum.

Fig. 3 (Doherty). Case 3. Above, showing size and position of tumor. Below, stereoscopic photographs taken about 1½ years later, showing the rapid enlargement of the growth, with metastasis around the iris somewhat resembling huge melanomata.

The growth was composed of small oval cells arranged in interlacing bundles. Pigment epithelium, lining the inner surface for a considerable distance, stood out in contrast. The growth entirely filled out the anterior chamber on this side. The pupillary zone of the iris was directed backward. The tumor touched the lens, causing some pressure atrophy. The retina showed two systems of cystic degeneration, one anteriorly cystic degeneration

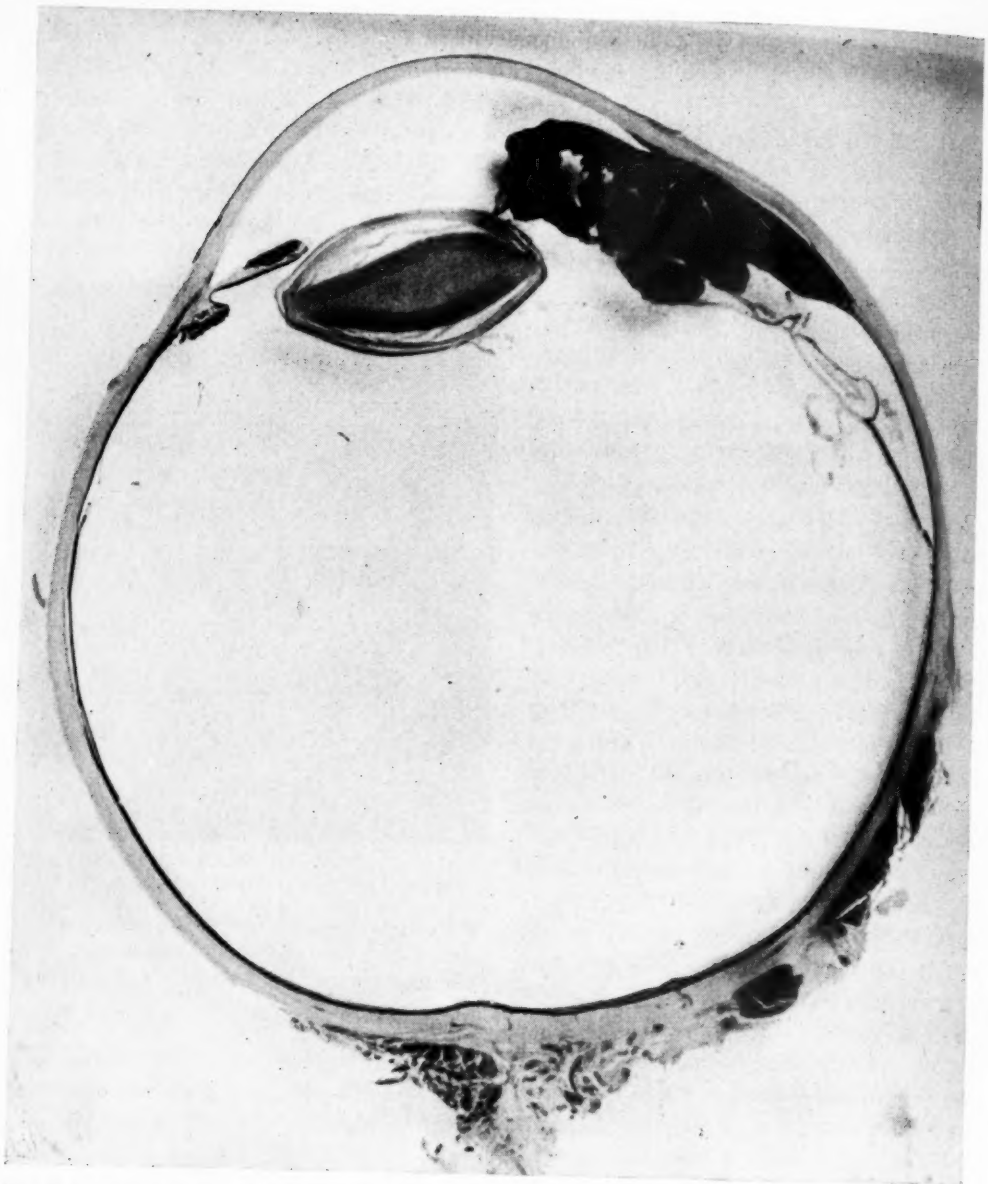

Fig. 4 (Doherty). Case 3. Microscopic section of enucleated eye, showing melanosarcoma involving the iris, ciliary body, and choroid, with metastatic tumor on iris of opposite side.

of Iwanoff, which on the side of the tumor extended well beyond the equator. In the posterior segment the second system of cystic degeneration took place in the macular region. The sections did not include the optic nerve, as the nerve was in the macroscopical section. Diagnosis. Melanosarcoma of the choroid, ciliary body, and iris, with cystic degeneration of the retina.

Conclusions

1. From the histories of these tumors it is reasonable to suppose that they are

less malignant than those of the choroid or ciliary body. This may be due to the fact that they are more easily observed, and immediately operated upon.

2. A beginning malignancy of a melanoma of the iris, as viewed from a clinical standpoint, would manifest itself by (1) an increase in size; (2) varying discolorations in the same growth; (3) an increased blood supply; (4) elliptical pupil and development of tension.

3. A cyst and a melanosarcoma may coexist.

4. The so-called ring sarcomas are extensions around the iris from the primary growth.

The question whether pigmentation plays a role in the malignancy of these growths is a much disputed one. I believe it does. A deeply pigmented growth with pigment running wild must mean something. It is true that we do have malignant leucosarcomas, but do they metastasize very rapidly, and do they not occur most frequently in the young?

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MECHOLYL AND PROSTIGMINE IN THE TREATMENT OF GLAUCOMA*

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It is the purpose of this paper to present two new drugs for use in the treatment of glaucoma, particularly of the subacute and acute types, and to discuss briefly the rationale behind present-day therapy in that disease. The new drugs which, so far as I can discover from the literature, have never been used very extensively, if at all, in glaucoma, are Mecholyl (methyl-beta-acetylcholine-chloride), sold by Merck and Company, and Prostigmine ($(CH_3)_2$ N.CO.OC_6-H_5N$(CH_3)_3$ SO_4CH_3) sold by Hoffmann-LaRoche Company.

First let us consider the drugs most commonly employed at the present time for the treatment of glaucoma: pilocarpine, eserine, and the epinephrine compounds. The way in which they reduce tension has never been completely and satisfactorily explained, but probably is about as follows:

MIOTICS

Most authors on glaucoma believe that the miosis frees the angle of the anterior chamber and thus facilitates passage of aqueous through Schlemm's canal. In addition, there may be involved specific action on blood vessels and on the formation of aqueous, since these miotics have sometimes been found to reduce tension in the glaucoma of aniridia, in secondary glaucoma with blocked pupil, and in long-standing chronic glaucoma with completely closed iris angle. Their action in these cases is not always dependable.

Pilocarpine. Pharmacologically the primary action of pilocarpine depends upon direct chemical stimulation of the cells in effector organs innervated by the parasympathetic nervous system. A prevalent theory claims the action of pilocarpine to be that of stimulation of the end organs of the parasympathetic. This view is quite fallacious, as can be shown by cutting the nerve supply to an effector organ of the parasympathetic and allow-

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ing ample time (about two weeks or more) for complete degeneration of all nerve endings and nerves to take place. If pilocarpine is then administered, a greater reaction will be seen to occur than that previous to nerve section, which goes far to disprove that hypothesis. From the best available evidence the action of pilocarpine is directly upon the end organs themselves.[1] Included with this is a slight vaso-dilatory action. It is most effective when used on a glaucomatous eye having a relatively dilated pupil, and when good miosis is obtained following its use. Pilocarpine is the most effective and generally used drug for chronic simple glaucoma.

Eserine is a more powerful and more lasting miotic than is pilocarpine, exerting a strong action for two or three hours. Physiologically the mechanism of its action is different from that of pilocarpine. It seems to depend on its "acetylcholine-esterase" inhibiting action, together with certain specific action on parasympathetic effector cells.[2] The urethane groups in eserine combine with esterase and make it ineffective. This allows the acetylcholine to accumulate by preventing its normal destruction: thus the concentration is increased; hence the cholinergic action is increased. The action of eserine on blood vessels, similar to that in the case of pilocarpine, is one of moderate dilatation. It is a marked synergist to mecholyl, doryl, and other cholinergic drugs. Its disadvantages are that it causes symptoms of hypersensitivity, deteriorates relatively rapidly, and is frequently very unpleasant to the patient, due to the rapidity and strength of its action. Relatively few patients are found who can tolerate long-continued eserine therapy.

Epinephrine compounds

Ordinary adrenalin first used by Hamburger (1923) in subconjunctival doses was supposed to cause a fall in tension, in spite of the mydriasis produced, due to vaso-constriction of the vascular uveal coat; the loss of blood producing a reduction in the volume of the intraocular contents. However, since the maximal effect was noted 12 to 24 hours after the treatment and long after the vaso-constriction had disappeared, Hamburger later concluded that the vaso-dilatation which succeeded was responsible for the effect; the active hyperemia flushing out the capillary bed and perhaps carrying away a certain amount of accumulated intraocular fluid. This explanation is perhaps as good as any other.[3]

The injections originally given were 4 min. of 1/1000 adrenalin, injections usually being made under the conjunctiva at the temporal side of the globe so as to be near the ciliary ganglion. Such treatments cause a rise in blood pressure generally and in some patients are accompanied by unpleasant systemic symptoms. Hamburger substituted for the ordinary levo-rotatory adrenalin, the synthetic dextro-rotatory adrenalin, which had the same effect on tension but none on blood pressure. This was also used by subconjunctival injection and given the very suggestive name, "Glaukosan."

Since then many different adrenalin compounds have been advocated by various workers and found to be effective by instillation. Among these may be mentioned 1- to 2-percent adrenalin borate or tartrate.

Because it was found that attacks of acute glaucoma not infrequently followed the use of adrenalin, even when used in combination with miotics, certain definite contraindications to its use became recognized. Gifford says that it should never be used in acute or hemorrhagic types of glaucoma and is very sceptical of its value in glaucoma secondary to uveitis.

The ill effects found in these cases are most likely due to the mydriasis which may block the iris angle and hinder filtration. As regards glaucoma, adrenalin compounds have found their greatest usefulness in chronic simple glaucoma, especially when associated with aphakia.

The unpredictability of the action of adrenalin compounds is physiologically explained by the fact that small doses of adrenalin frequently dilate the smaller blood vessels while larger doses do the reverse, and extremely large doses produce great hyperemia by paralyzing all the blood vessels. This varied action combined with the possible effect of mydriasis upon the iris angle makes adrenalin a very uncertain remedy. It is also a very expensive, rapidly deteriorating drug, and occasionally causes a great deal of pain, especially when used in secondary glaucoma.

Theoretically, any drug which either paralyzes the action of the sympathetic nervous system or mimics that of the parasympathetic might be of use in glaucoma. On looking for a possible parasympathetic-mimetic drug, acetylcholine seemed to me to be the logical choice to try as a new drug in the treatment of glaucoma. One other new drug, namely prostigmine, also seemed worthy of trial, as its action closely follows that of eserine.

Acetylcholine

Acetylcholine or a similar substance is assumed to be produced at all parasympathetic nerve endings and is considered to be the substance responsible for the action of the effector organ.[4] It is even produced in the sympathetic synapses, although not at the sympathetic nerve endings at the effector organ, where sympathin is formed. The action of acetylcholine is only momentary. This is due to its rapid inactivation by hydrolytic splitting into choline and acetic acid by the action of an enzyme "acetyl-cholinesterase," which is found in the blood stream and in the tissue juices but not in the normal aqueous. The esterase rapidly appears in the aqueous after disturbances such as paracentesis. This has been proved by experiments on cats.[5]

A cat's blood pressure is lowered quite readily by acetylcholine, but this effect is prevented if aqueous is added to the acetylcholine solution, because the esterase, brought to the aqueous by the trauma of paracentesis, destroys the acetylcholine. This hydrolysis of the acetylcholine can be abolished by the addition to the aqueous of eserine, which prevents the esterase from destroying the acetylcholine. The esterase obtained by the trauma of the paracentesis probably comes into the aqueous primarily from the vitreous, which has a high esterase content, and to some extent from the iris and ciliary body.

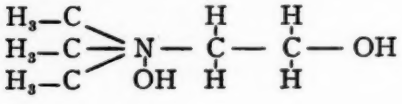
Physiologically, acetylcholine is a rapidly acting, strong miotic, although its effect is of very short duration. Cholinergic drugs are all extremely potent vaso-dilators. This latter action occurs on vessels of all caliber and accounts for the good results reported from its use in Raynaud's disease, Buerger's disease, chronic arthritis, and other peripheral vascular diseases.

Uses of mecholyl: 1. Peripheral-vascular disease. 2. X-ray gastrointestinal series. 3. Paroxysmal tachycardia. 4. Postoperative urinary difficulties. 5. Postoperative gastrointestinal distention. 6. Spasm or embolus of the central retinal artery.[6] 7. Arthritis.

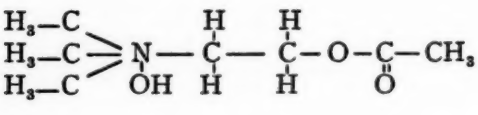
When used in arthritis by the method of iontophoresis, there is, at the site of application, where peripheral vascular spasm has been present, an increase in skin temperature of 4 to 10 degrees Fahrenheit which persists for several

hours. This vaso-dilatory action can be observed directly under the microscope in animals and seems to be greatly enhanced by massage at the site of injection.

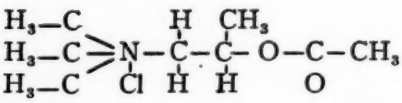
Clinically, it is not practical to use acetylcholine because its action is too evanescent. A synthetic drug, mecholyl (Merck), intimately related both chemically and physiologically to acetylcholine, was therefore chosen, instead. The chemical similarity is here shown:



Choline



Acetylcholine



Acetyl-beta-methylcholine chloride (Mecholyl)

Mecholyl occurs as a fine, white, crystalline substance that is freely soluble in water. It forms a bitter solution that is relatively stable to heat. The crystals are very hydroscopic and must be protected from atmospheric moisture, but once put up in solution will be effective for as long as a month. Mecholyl has been administered in general medicine by iontophoresis, by mouth, and by injection intramuscularly, but cannot be used intravenously.[7] It is similar to acetylcholine in action, but is much more powerful, and its action persists for a much longer period. Furthermore, it is devoid of the so-called "nicotine" effect of acetylcholine.

In common with acetylcholine it contracts the pupil, increases the heart rate, lowers blood pressure, constricts the bronchioles, stimulates the activity of the sweat glands and of the secretory glands of the gastro-intestinal tract, increases intestinal tone, stimulates peristalsis, contracts the detrusor muscles of the bladder and anal sphincters, and dilates all the blood vessels of the peripheral vascular system.[8, 9, 10]

It is a direct physiological antagonist to adrenalin and atropine. After injection, its general effect comes on within 2 minutes and passes off after 20. Large subcutaneous doses make subjects very uncomfortable. Asthmatic attacks and even death can be produced in patients subject to asthma or other pronounced allergy. Nausea and vomiting are common when large doses are administered and there is a very pronounced fall in blood pressure.

The systemic effects of mecholyl may be instantly abolished by means of 1/100 grains of atropine sulphate given intravenously; and over a period of 5 to 10 minutes, if the atropine is given subcutaneously.

Clinical action of mecholyl, in one respect, is apparently somewhat similar to that of adrenalin, if one accepts Gifford's theory of the action of adrenalin; namely, that it causes an active hyperemia of the ocular vascular bed which carries away accumulated and relatively stagnant blood in the smaller blood vessels. In addition, mecholyl is without the dangerous mydriatic action of adrenalin and it has the decided advantage of being a strong miotic.

Although there is no definite proof

available at the present time, it is my opinion that eventually the action of many of our antiglaucomatous drugs will be found to lie in their effect upon the formation or absorption of aqueous.

My use of the drug at the Massachusetts Eye and Ear Infirmary was started with retrobulbar and subconjunctival injections in acute and subacute cases of simple and congestive glaucoma, and the results were so striking that a 20-percent solution as drops was tried. Retrobulbar injection was found preferable to subconjunctival injection because in a congested eye it is less painful and avoids subconjunctival hemorrhage. Recently, its action as a synergist to another new drug—prostigmine—has been found to be most effective.

By retrobulbar and subconjunctival injection mecholyl is opposite in action to adrenalin; in that it lowers the blood pressure instead of raising it, causes miosis instead of mydriasis, and symptoms of parasympathetic stimulation instead of sympathetic stimulation. It causes a passing redness of the eye instead of a blanching. It is also dissimilar to adrenalin in that it causes great active hyperemia of the ocular blood vessels *immediately*, while the same effect, if it occurs at all, is delayed when adrenalin is used until the primary vasoconstriction has had time to pass off. For this reason and because mecholyl causes an almost immediate sharp fall in blood pressure, it produces a much more rapid and a much greater fall in the intraocular tension than does adrenalin and is strongly indicated in acute glaucoma, while adrenalin is usually definitely contraindicated here due to its causing mydriasis and elevation of general blood pressure.

Unfortunately, this condition of vascular dilatation cannot be expected to persist for long (over one-half hour) with injected mecholyl. Similar action can be obtained by instilling the drug into the conjunctival sac, but in that case the action will naturally be much shorter in duration, and generally less effective than if the injection method were employed. However, once the pressure is lowered, the amount of drug action needed to maintain the lower level of pressure is much less than that required to bring about the initial drop. At this time, more dilute solutions of mecholyl or preferably of longer-acting miotics such as pilocarpine, prostigmine, or eserine are used to advantage and will usually hold the tension to normal thereafter if miotics alone are to be successful.

Once the pressure has been brought down, surgery can also be used to advantage. The actual surgical procedures will be greatly facilitated technically and there will be less danger of hemorrhage into the eye from the sudden lowering of pressure. This is perhaps one of the greatest values of mecholyl. It will bring down the tension in acute glaucoma so that surgery is more easily and more safely done, and when the general blood pressure and intraocular vascular blood pressure do rise, one-half to one hour later, the blood vessels are relatively constricted as the pressure rises. I have never seen any ill effects coming on at this time from hemorrhage.

Although mecholyl alone has a rather evanescent action, it may be used to advantage over long periods of time as a synergist of eserine, pilocarpine, or prostigmine.

No general symptoms of any kind have been noted following the instillation of mecholyl into the conjunctival sac. Locally, there is a dilatation of the conjunctival vessels lasting about 15 minutes. Following retrobulbar or intramuscular use, however, the following general symptoms and signs may appear, almost immediately:

1. Sweating
2. Salivation
3. Fall in blood pressure
4. Nausea
5. Skin feels hot
6. Slight dyspnea
7. Urinary urgency

These symptoms may be extremely severe and dangerous, especially in old or hypertensive individuals, if extreme doses are given, but if 0.03 gm. is taken as a maximum dose for healthy adults, and 0.010 gm. as probably the minimal effective dose in elderly or emaciated patients, no severe reactions should occur.

It is of paramount importance that injection never be given unless atropine in a form suitable for injection is handy—preferably doses of 1/100 gr. This is usually simple as in an emergency the same needle and syringe can be used with 1-percent solution of atropine found in the office of every ophthalmologist as a source of antidote. When given intramuscularly, this will quickly abolish all systemic reaction. If atropine is not given the symptoms pass off in about 20 minutes.

In asthmatic or markedly allergic patients mecholyl injections should never be used because of the danger of sudden death from bronchiolar constriction and respiratory failure, which may be precipitated by the injection.

Case Reports

Case 1. H. A. had an immature cataract with acute exacerbation of glaucoma in the right eye, congestive in spite of 2-percent pilocarpine administered three times daily. Tension in the right eye was 100 plus mm. Hg (new Schiötz). Treatment consisted of 20-percent mecholyl drops given every 10 minutes for one hour, at the end of which time the tension had been reduced—to 14 mm. Hg—and the pupil being in extreme miosis.

Case 2. J. Y. had chronic glaucoma in the left eye; trephining two years previously controlled the tension, with pilocarpine 1 percent in both eyes as a prophylactic. He now came in with a tension of 38 mm. Hg in the right eye, which in spite of pilocarpine and eserine every 10 minutes for six doses went up to 60 mm. in the right eye in a few hours. Mecholyl, 20 percent in drops, was administered every 10 minutes. In an hour the tension was 14 mm.

Case 3. R. G. had an acute first attack of congestive glaucoma in the right eye, with shallow anterior chamber, steamy cornea, and irregular dilated pupil. The tension in this eye was 92 mm. Hg. After seven doses of mecholyl (20 percent), and prostigmine (5 percent) drops the pupil became smaller, but the tension in the right eye was not reduced below 55 mm. A retrobulbar injection of 0.02 gm. was given and in three minutes the tension in this eye was 12 mm. and stayed there under miotics.

Case 4. A private patient of Dr. F. H. Verhoeff had a first attack of acute congestive glaucoma in the right eye, with steamy cornea, irregular pupil, and almost nonexistent anterior chamber, plus four congestion, tension 125 mm. Hg (new Schiötz). The left eye was white and quiet, but tension was 55 mm. The patient was 72 years old, obese, with a blood pressure of 250/130. After one hour of mecholyl (20 percent) and prostigmine (5 percent) administered every 10 minutes, the tension in the right eye was 50 mm., in the left eye 18 mm. Under the same therapy given every half hour the tension was reduced to 14 mm. in each eye within three hours, and the cornea was clear. The patient was put on mecholyl (20 percent) prostigmine (5 percent) every three hours over night. The next morning the tension in each eye

was 12 mm. She was sent home on pilocarpine (2 percent four times a day) and returned in three days with the right eye acutely congested, the tension up to 90 mm.; tension O.S. 20 mm. Hg (new Schiötz). Under similar mecholyl-prostigmine treatment for two hours the tension in each eye was 14 mm. (n.S.) and the eye whitened for surgery the next day.

Prostigmine

This drug has a pharmacological action similar to that of eserine;[11] namely, that it inhibits the action of "A-C"-esterase. It differs from eserine in that it does not cause so much unpleasantness locally to the patient, has a stronger miotic action, and will not deteriorate so quickly as eserine. In addition it can be used in twice as strong concentration as eserine and causes less systemic reaction, such as nausea, when employed frequently as drops. The miosis it produces is usually greater than that caused by equivalent concentrations of pilocarpine and eserine, especially if used in conjunction with its most marked synergist—mecholyl.

Case Reports

Case 1. A. A. had chronic simple glaucoma in both eyes. Four days tension study in the Infirmary gave the following record:

Pilocarpine (4 percent, q.i.d.)

A.M.	Right eye 30	Left eye 36 (complete blindness in this eye)
P.M.	24	28

Upon shifting to prostigmine (5 percent q.i.d.)

A.M.	Right eye 18	Left eye 26
P.M.	16	20

The patient was finally sent home and the tension was well controlled for four months. She is now on prostigmine (3 percent) and mecholyl (10 percent), one drop of each four times a day.

Case 2. C. S. had had acute congestive glaucoma in each eye for seven days; worse in the right eye, with extreme chemosis of the conjunctiva, absent anterior chamber, steamy cornea, and dilated pupil.

The tension in the right eye was 77 mm. Hg, in the left eye 56 mm. (n.S.) After one hour's administration of mecholyl (20 percent) and prostigmine (5 percent), 1 drop of each given every 10 minutes, the tension was reduced to: right eye, 36 mm.; left eye, 20 mm.; and in a few hours both eyes had a tension of 20 mm. (n.S.)

Theoretically a maximum miosis or tendency toward producing miosis would be obtained by using:

1. Mecholyl to stimulate the sphincter muscle directly.
2. Prostigmine to inhibit esterase from destroying both the mecholyl and the normally produced acetylcholine.
3. Pilocarpine for its specific action on the sphincter muscle. One might even use ergotamine tartrate subcutaneously, in addition, to paralyze the sympathetic and allow the others an absolutely free rein.

Prostigmine, used alone or in conjunction with mecholyl drops, has shown great promise in the treatment of chronic glaucoma, although sufficient time has not elapsed to allow final conclusions to be made on this aspect of its use. It seems, at least, to be much less irritating than equally effective concentrations of eserine.

At the present time about 25 to 40 patients with chronic, simple glaucoma are being held under control with prostigmine and mecholyl drops. The results are very promising in that many of these patients who had not been so fortunate

under pilocarpine and eserine are having their glaucoma controlled with prostigmine combinations. For chronic use, to avoid unpleasant symptoms similar to those caused by eserine, it is occasionally necessary to use 10-percent mecholyl and 3-percent prostigmine, instead of the 20-percent mecholyl and 5-percent prostigmine used in acute cases.

A good routine treatment for a case of acute congestive glaucoma with mecholyl and prostigmine might be outlined as follows:

1. Morphine gr. 0.25 subcutaneously if pain is marked.
2. Mecholyl 20-percent, prostigmine 5-percent, one drop a.a. given every 10 minutes for seven doses. If the tension has not approached normal after one-and-a-half hours, then inject retrobulbarly, preferably with a retrobulbar no.-25 needle and tuberculin syringe: 0.025 gm. of mecholyl in 1 c.c. of 2-percent procaine.
3. Continue the drops for another five doses.

When prostigmine is not available, 0.5-percent eserine may be used instead, for its physiological action is similar to that of prostigmine.

Mecholyl has been used most frequently by the retrobulbar method for acute glaucoma only, and very frequently has brought the tension to normal in from 2 to 20 minutes. Mecholyl injections were not used in any cases except those of acute glaucoma because, obviously, one cannot continue to inject any drug over a long period of time. Therefore, it was considered best to use some form of drug-instillation therapy in the chronic cases of glaucoma.

From relatively short experience, retrobulbar injection of mecholyl seems to be a most effective medical way of rapidly reducing high tension in acute glaucoma, whether it be primary or secondary in nature. This should find a wide field of

TABLE 1

RESULTS OF MECHOLYL AND PROSTIGMINE THERAPY OF GLAUCOMA

Type of Glaucoma	Total	Mecholyl (drops)			Mecholyl (retrobulbarly)			Mecholyl and Prostigmine (drops)			Mecholyl and Prostigmine and Pilocarpine		
		+	±	−	+	±	−	+	±	−	+	±	−
Acute congestive	32	2	0	1	14	4	2	8	0	1	0	0	0
Aphakia	10	1	1	0	5	1	0	1	1	0	0	0	0
Secondary, etc. (traumatic, discissions, blocked pupil)	14	1	0	0	3	3	1	3	3	0	0	0	0
Chronic simple	42	3	1	1	3	0	0	23	2	1	7	0	1
Buphthalmos	2	1	1	0	0	0	0	0	0	0	0	0	0
Total number treated	100	8	3	2	25	8	3	35	6	2	7	0	1

RESULTS OF ALL CASES TREATED IN THIS SERIES

Number of cases	+	±	−
100	75	17	8
Percent	75	17	8

Legend: + = cases brought to normal tension for minimum of two days, and usually either permanently or until put on other treatment. ± = cases brought to tension of 35 mm.Hg (new Schiötz) or under, long enough to permit a relatively safe surgical intervention. − = cases in which tension was not reduced below 40 mm. Hg (new Schiötz).

use in pre-operative glaucoma work, even when the tension is secondary to lens material in the anterior chamber following discission of congenital cataract.

Case. E. O'B., a 35-year-old female in good health, had been needled for congenital cartaract three days previously. She had been suffering from acute congestive glaucoma for 12 hours in spite of the intensive use of 2-percent adrenalin borate and atropine. A retrobulbar injection of 0.025 gm. mecholyl in procaine at the time of operation lowered the tension from 60 mm. Hg (new Schiötz) to 28 mm. in five minutes; at which time the keratome lowered it to almost 0 (new Schiötz) as a linear extraction was started. No complications from hemorrhage ensued.

Conclusions

1. In this short series, it is interesting to note that in six of the eight cases listed as failures there was subsequent trial of intensive anti-glaucomatous therapy using other drugs. In no case was the status of the patient improved and in four cases it became definitely worse.

2. Of the 61 patients in this series under routine treatment with other anti-glaucomatous drugs when first seen, 41 were using pilocarpine, 10 were using pilocarpine and eserine, and 10 were using epinephrine compounds.

3. Twelve of these patients had previously had intensive pilocarpine and eserine treatment without success before being treated with mecholyl or prostigmine, and in 10 of these the tension was brought to normal.

4. Three patients had had intensive adrenalin-borate treatment before being seen, and two of these were brought to normal.

From the results presented, it would appear that mecholyl and prostigmine may prove of considerable value in the treatment of glaucoma, especially in the acute and subacute stages.

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THE RETINA IN SEPTIC AND CHRONIC ENDOPHTHALMITIS OF ECTOGENOUS ORIGIN*

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E. Fuchs[1] introduced the term septic endophthalmitis to designate the ocular condition characterized by the exudation of pus cells into the vitreous from the ciliary body and retina following the deposit of toxins in the vitreous. The designation purulent or septic uveitis is not fully applicable because the choroid is protected by the retina from the toxins in the vitreous and is only secondarily involved. In a recent paper, the present writer[2] reported that in each of 32 eyeballs with septic endophthalmitis of ectogenous origin, at least a few macrophages or exudative cells of chronic inflammation were intermingled with the pus cells in the vitreous. Twenty-four of these thirty-two eyeballs had small round-cell infiltration in the ciliary body and choroid; and the macrophages in the vitreous were generally quite numerous even in the first days of the inflammatory process. Corresponding with the density of the macrophages in the anterior part of the vitreous was the stage of formation of a cyclitic membrane. The condition in these 24 eyes was called complicated septic endophthalmitis.

It is the prevailing kind of phagocytic cell in the vitreous derived from the ciliary body and retina that determines the type of intraocular inflammation. If the microphages or pus cells predominate, septic endophthalmitis is present; if macrophages are rife, chronic endophthalmitis would seem the appropriate diagnosis. The essential factor in chronic endophthalmitis is exactly the same as that in septic endophthalmitis; namely, the presence of toxins in the vitreous chamber. Whether the inflammatory process is acute, mixed, or chronic depends upon its intensity from high to low, as pointed out by J. Lossen.[3] The intensity of the inflammation must vary with the virulence and number of the bacteria present versus the resistance of the infected tissue. Bacteria deposited in the vitreous chamber are, of course, opposed with considerable difficulty since the vitreous contains no blood vessels. Anatomic examination of the eyes with septic endophthalmitis has shown that in an overwhelming majority, a considerable degree of chronic endophthalmitis was present together with the acute or septic process. It is actually, then, a mixed acute and chronic process.

In the previous paper, the relative number of pus cells and macrophages in the posterior or retinal portion of the vitreous were included in a table for each of the 24 eyes with complicated septic endophthalmitis. Although these phagocytic cells in the posterior vitreous were entirely derived from the retina, nothing was reported as to conditions in the retina itself.

In the present paper, there will be tabulated the relative number of pus cells and macrophages coming from the anterior and posterior halves of the retina, the degree of round-cell infiltration in the anterior and posterior halves of the retina (always confined to the inner layers of the retina), the amount of perivasculitis, and whether a connective-tissue membrane on the inner surface of the retina is in process of formation. By the term round cells is meant the macrophages, small lymphocytes, and plasma cells.

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Septic endophthalmitis

There is not included in this study cases of simple septic endophthalmitis since the findings in the retina in this condition are quite uniform. The endophthalmitis in these eyes is in an acute or fulminant stage. The irritant deposited in the vitreous in these cases is so virulent as to cause emigration of almost entirely pus cells from the retina. No perivasculitis of round cells can therefore be present. The number of pus cells from the anterior half of the retina is always much less than from the posterior half because of the richer blood supply to the latter. A dense mass of pus cells frequently observed lying internal to the anterior end of the retina in simple septic endophthalmitis has its source in the adjacent ciliary body where the blood supply is obviously excellent. It is not uncommon in this condition to have the retina entirely destroyed by the virulent toxins in the vitreous.

In the present table, there are included eyes with complicated septic endophthalmitis, now 28 in number, out of 36 eyes of simple and complicated septic endophthalmitis. Only cases of ectogenous origin are used, although those with an endogenous source present exactly the same cytologic changes, as pointed out by E. Fuchs. However, in the latter, a definite time for the start of the inflammation cannot be determined. The principal characteristics of complicated septic or mixed endophthalmitis, as far as the vitreous is concerned, are large numbers of pus cells, at least in its anterior portion or where it is surrounded by the ciliary body, together with numerous macrophages in the same place. In other words, a considerable intensity of the inflammatory process leads to the production of many macrophages. Since macrophages can change to fibroblasts (Lamb[4]) and lead to the formation of a cyclitic membrane along the inner surface of the ciliary body, eyes with complicated septic endophthalmitis are prone to show the development of connective-tissue membranes on the inner free surface of the ciliary body.

In the table, the eyes are arranged according to the length of the interval from the time of the penetration of the globe to the date of enucleation. As reported in the former paper, the macrophages or exudative cells of chronic inflammation appear almost at once (two days here) in the vitreous internal to the retina. This simultaneous appearance of significant numbers of macrophages wth the pus cells must be due to the weakening of the toxins from the vitreous as they penetrate more deeply into the inner layers of the retina. Where the toxins are still virulent or strong, they cause the emigration of pus cells from the retinal blood vessels. As the toxins become weakened by the tissue fluids, they tend to stimulate the production of macrophages. The continuous weakening of the toxins in the vitreous from the defensive bodies in the fluid exudate coming into the vitreous from the ciliary body and retina should influence the inflammatory process to become gradually more chronic or to show proportionally more macrophages in the vitreous. From a study of the table of the eyes with septic endophthalmitis, where in the last eye the inflammation is four months old, it is seen that the general tendency is but slightly toward chronicity. This finding would appear to emphasize the very meager defensive qualities of the vitreous, even after several months' duration of the inflammation.

A study of the number of emigrating cells from the retina into the vitreous shows in the case of both the pus cells and macrophages that they are generally more numerous from the posterior half of the retina where the blood supply is greater. That the latter finding is not entirely uniform must be partly due to the

TABLE 1

DATA IN CASES OF COMPLICATED SEPTIC ENDOPHTHALMITIS AND OF CHRONIC ENDOPHTHALMITIS

Case No.	Kind of Injury or Operation	Interval between Penetration and Enucleation	Anterior Retina Quantity of Pus Cells	Posterior Retina Quantity of Pus Cells	Anterior Retina Quantity of Macrophages	Posterior Retina Quantity of Macrophages	Anterior Retina Quantity of Round Cells	Posterior Retina Quantity of Round Cells	Degree of Perivasculitis	Presence of Connective Tissue on Inner Surface of Retina
CASES OF COMPLICATED SEPTIC ENDOPHTHALMITIS										
544	particle steel in vitreous	2 days	few	many	few	moderate	few	moderate	mild	none
61	corneal wd. from weed	4 days	moderate	many	few	moderate	few	few	mild	none
1428	corneal wd., unknown f.b.	5 days	moderate	many	few	moderate	few	moderate	mild	none
2168	particle steel in vitreous	6 days	few	few	few	few	few	few	mild	none
999	particle steel in vitreous	7 days	many	few	many	few	none	none	mild	formation of fibroblasts
2119	trephine operation	7 days	many	many	few	moderate	none	few	mild	none
562	corneal wd. screwdriver	9 days	few	few	few	few	none	none	mild	none
1861	particle steel in vitreous	10 days	few	many	few	moderate	none	few	mild	none
565	wd. at limbus, unknown f.b.	2 weeks	moderate	moderate	moderate	moderate	moderate	moderate	moderate	none
1330	wd. at limbus from fork	2 weeks	few	moderate	few	moderate	few	moderate	mild	incipient
2172	corneal wd., piece steel	2 weeks	moderate	few	moderate	few	moderate	moderate	mild	none
2218	perforating corneal ulcer	2½ weeks	moderate	many	none	few	none	few	mild	none
1345	particle steel in vitreous	3 weeks	few	moderate	few	few	none	few	moderate	none
1645	particle steel in vitreous	3 weeks	few	moderate	few	moderate	few	few	moderate	incipient
785	cataract extraction	3 weeks	moderate	moderate	few	few	none	few	none	none
98	wd. at equator from shot	3½ weeks	few	few	few	few	few	few	mild	none

2344	particle steel in vitreous	3½ weeks	few	few	few	few	few	moderate	moderate	none
1021	corneal wd. from nail	4½ weeks	moderate	few	moderate	moderate	few	moderate	moderate	incipient
2253	corneal wd., piece steel	4½ weeks	few	many	few	many	few	few	none	incipient
1041	wd. at limbus from glass	5 weeks	moderate	few	moderate	moderate	few	moderate	mild	none
1374	corneal wd., piece steel	5 weeks	none	few	none	few	none	few	mild	none
1970	corneal wd., piece steel	5 weeks	moderate	few	moderate	few	moderate	few	moderate	none
250	corneal wd., end of wire	6 weeks	few	moderate	few	moderate	few	few	intense	none
482	iridectomy for glaucoma	6 weeks	few	few	moderate	many	few	moderate	mild	incipient
2358	corneal wd. from nail	2 months	few	moderate	few	moderate	few	few	mild	none
1899	perforating corneal ulcer	3½ months	few	moderate	none	moderate	none	moderate	moderate	none
1132	wd. at limbus from shot	4 months	none	none	moderate	moderate	moderate	moderate	intense	incipient
1275	wd. at limbus from glass	4 months	few	many	moderate	many	moderate	many	moderate	none

CASES OF CHRONIC ENDOPHTHALMITIS

1510	corneal wd. from wood	12 days	none	none	few	few	few	few	slight	none
2059	corneal wd. from rock	6 weeks	none	none	none	none	few	few	mild	none
1906	corneal wd. from glass	8 weeks	none	none	few	few	few	few	mild	none
866	particle steel in vitreous	2¼ months	none	none	none	none	none	none	none	none
1952	trephine operation	3 months	none	none	few	few	few	few	moderate	none
2304	trephine operation	3 months	none	none	few	moderate	few	moderate	mild	none
1349	iridectomy for glaucoma	5 months	none	none	none	few	none	none	none	none

varying depths of penetration of the etiologic agent.

Pus and red blood cells emigrating from the retina in septic endophthalmitis may detach the vitreous (fig. 1) and come to lie between the unbroken internal limiting membrane of the retina and the intact hyaloid membrane.

Just as in the case of the anterior or cyclitic portion of the vitreous, the pus cells with their greater activity generally move farther into the vitreous while the macrophages as a rule remain near the inner surface of the retina. On account of the latter, the retinal membrane developed from the macrophages in the vitreous lies close to the retina. The effect of the toxin in the vitreous may exceptionally lead to the formation from the macrophages of foreign-body giant cells on the inner surface of the retina (fig. 2).

Varying fairly closely with the number of macrophages coming from the anterior and posterior halves of the retina are the relative amounts of round or chronic inflammatory cells infiltrating or lying within these parts of the retina.

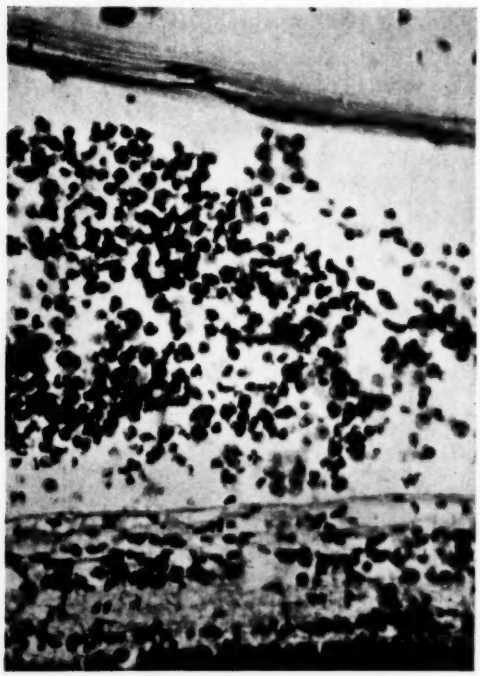
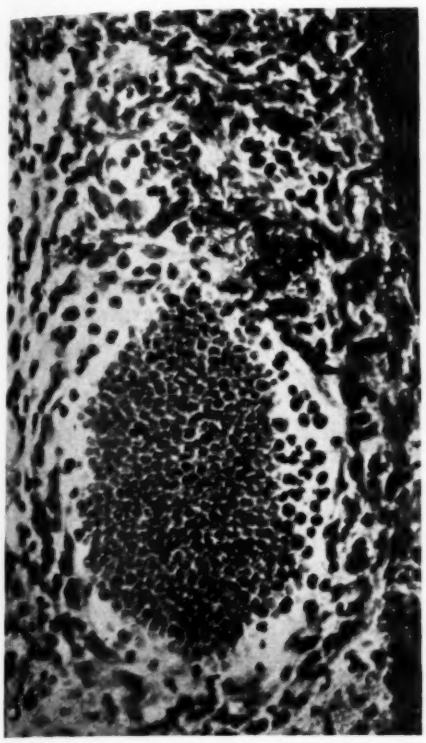


Fig. 1 (Lamb). Case 2218. Section through part of eye with septic endophthalmitis, showing pus and red blood cells from retina producing a detachment of the vitreous.

Fig. 2 (Lamb). Case 1132. Section through part of eye with septic endophthalmitis, showing foreign-body giant cells formed from macrophages on the inner surface of the retina.

Since all the inflammatory cells infiltrating and coming from the retina must arise within or around the retinal blood vessels, the perivasculitis is by far the most significant feature of the reaction of the retina to toxins in the vitreous. Perivasculitis, in at least a mild degree, was present in all but 2 of the 28 eyes with complicated septic endophthalmitis. A moderate intensity of perivasculitis was present in 8 eyes and an intensive degree in 2 eyes of this series. In eyes in which the inflammatory process was not more than two weeks old, but in a majority of the longer-inflamed eyes also,

only macrophages form the infiltrating cells of the perivasculitis and of the adjacent inner layers of the retina (figs. 3 and 4). Within the lumina of the affected blood vessels, monocytes are commonly observed together with pus cells. Maximow[5] derives the macrophages of inflamed tissue much more commonly from the lymphocytes and monocytes of the blood than from the local histiocytes situated around the blood capillaries. Among the present series, in seven eyes, small lymphocytes and plasma cells participated in the perivasculitis. In all seven eyes, the inflammation had been present for two weeks and more. In the case of these seven eyes, small lymphocytes and plasma cells together with macrophages infiltrated the inner layers of the retina adjacent to the blood vessels that presented perivasculitis. The small lymphocyte in the retina can only come from the blood. It is generally agreed that the plasma cell is derived from the small lymphocyte.



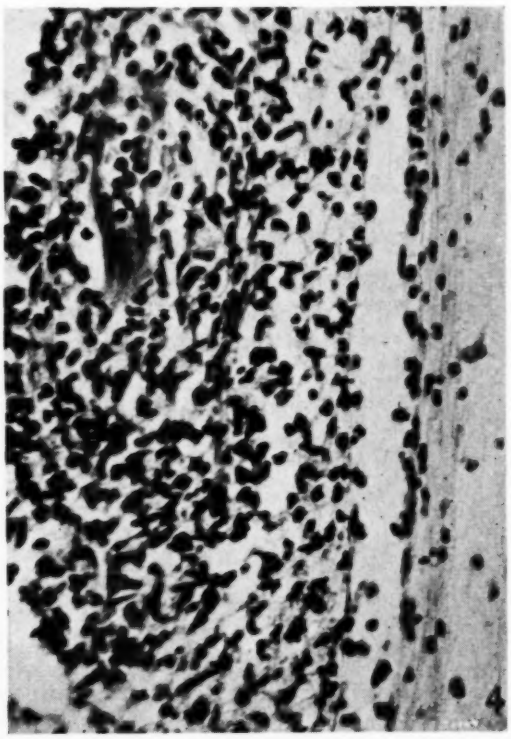


Fig. 3 (Lamb). Case 2119. Section through part of eye with septic endophthalmitis showing retinal perivasculitis composed of macrophages. At the periphery of the bloodstream on the right, there occur numerous monocytes.

Fig. 4 (Lamb). Case 1899. Section through part of eye with septic endophthalmitis showing retinal perivasculitis composed of macrophages and numerous monocytes within the bloodstream. To the right on the inner surface of the retina, macrophages from the retina are elongating into fibroblasts.

Keller[6] reported two cases with retinal perivasculitis in septic endophthalmitis. In the first case, the eye was removed four weeks after a perforating injury through the cornea and adjacent sclera. A moderate degree of septic endophthalmitis had caused an exudation of pus cells from the anterior portion of the

retina. Posteriorly, there was present no exudate of pus cells from the retina but an intensive degree of perivasculitis. In the second case, through the use of intramuscular milk injections, the vitreous became sufficiently clear to obtain the very unusual ophthalmoscopic picture of retinal perivasculitis. Posteriorly, along the veins only, there occurred 16 well-disseminated, small, white, fairly well-circumscribed spots. In the following few days with the healing of the eye, these spots entirely disappeared. This valuable contribution emphasized the overwhelming involvement of the retinal veins over the arteries and the focal arrangement of retinal perivasculitis.

Chronic endophthalmitis

For comparison with the eyes having septic endophthalmitis, seven eyes with chronic endophthalmitis are included in the table. The difference in the retinal findings of the eyes with chronic endophthalmitis as compared with those having septic endophthalmitis is striking in respect to the intensity of the inflammatory process. The retinal macrophages were generally much less numerous in chronic endophthalmitis than in septic endophthalmitis. The retinal perivasculitis was not so intensive, causing less infiltration of round cells in the retina and fewer macrophages in the vitreous. Small lymphocytes are only occasionally observed among the perivascular macrophages and in the retinal infiltration of chronic endophthalmitis. Nevertheless there were enough inflammatory changes in the retina of these eyes with chronic endophthalmitis to demonstrate that the essential etiologic factor (the presence of toxins in the vitreous) is the same as in septic endophthalmitis. This fact was clearly confirmed beyond any dispute in all seven eyes by the presence of numerous macrophages on the inner surface of the ciliary body. The much better blood supply in the ciliary body as compared with that in the retina would explain the greater number of macrophages emigrating from the ciliary body through chemotactic action of the toxins in the vitreous. The choroid presented very little cellular infiltration in these eyes with chronic endophthalmitis with the exception of case 2304. Here the choroid was a little thickened by dense infiltration with small lympocytes and plasma cells occupying its external layers. In the writer's recent article[2] similar infiltrations of the choroid were reported as occurring in septic endophthalmitis and being due to toxins in the vitreous. In case 2304, the retina was considerably degenerated and therefore more porous to toxins in the vitreous.

It is true that in the tabulation, eyes with chronic endophthalmitis are greatly outnumbered by those with septic endophthalmitis. Nevertheless there are sufficient cases to demonstrate clearly that, as a rule, in chronic endophthalmitis, the macrophages or exudative cells of chronic inflammation are considerably less numerous than in septic endophthalmitis. In the latter, a much greater intensity of the inflammatory process prevails than in chronic endophthalmitis.

As regards the spontaneous formation of connective tissue on the inner surface of the retina or retinitis proliferans, Leber[7] wrote in considerable detail. After serious injuries to the eye, this formation of connective tissue occurred in the midst of red blood cells, rarely in the presence of inflammatory exudate on the inner surface of the retina. This new formation of connective tissue was known as organization. With other observers, Leber considered the essential process to be combined with a hyperplasia of the supporting structure of the retina. In our series, the formation of connective tissue

on the inner surface of the retina was noted in six eyes with septic endophthalmitis and in none of the seven with chronic endophthalmitis. As illustrated in figure 5, it can be seen that fibroblasts develop from macrophages to form this

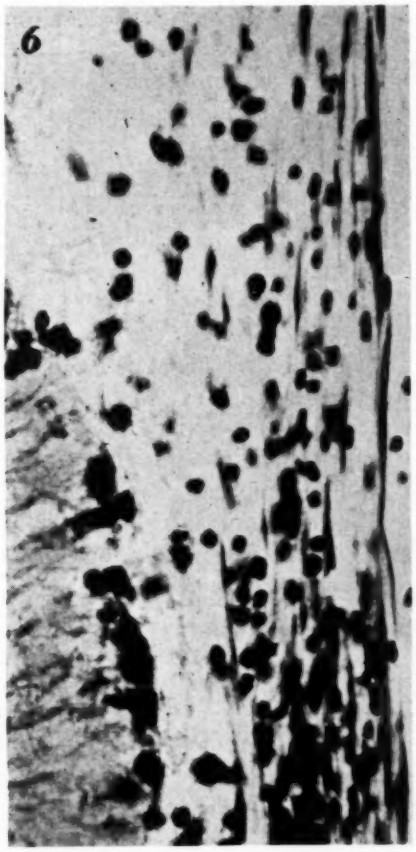


Fig. 5 (Lamb). Case 1899. Section through part of eye with septic endophthalmitis showing macrophages coming from the retina on the left, in the process of developing into fibroblasts.
Fig. 6 (Lamb). Case 1132. Section through part of eye with septic endophthalmitis showing on the right an incipient connective-tissue membrane formed from and infiltrated with retinal macrophages.

connective tissue on the inner surface of the retina just as in the case of the cyclitic membrane (Lamb[4]). In figure 6, a thin layer of connective tissue produced from retinal macrophages is presented. This is all that organization of a hemorrhage or of an inflammatory exudate within the vitreous can ever mean. The hyperplasia of the neuroglia cells or supporting structure of the retina always occurs to some degree in every degenerated retina. Secondary degeneration of the retina invariably accompanies any serious case of endophthalmitis. If the connective tissue developed on the inner surface of the retina is a neuroglial structure, it will not stain red with the acid-fuchsin of Van Gieson's stain, as it does. This layer of connective tissue is appropriately termed a retinal membrane.

As to the rapidity with which this connective tissue forms it is noted in the table

for case 999 that fibroblasts on the inner surface of the retina were developing from macrophages seven days after the start of the inflammation. In addition, two weeks after the etiologic penetration in case 1330, connective tissue in this situation was beginning to be produced by fibroblasts, derived from macrophages. Of course, contraction of this newformed connective tissue sooner or later leads to retinal detachment, but since the eyes in these cases were already destroyed by irreparable injury to the ciliary body (Lamb[2]), the sequelae of cylitic or retinal membranes were not of much clinical importance.

Summary

The principal retinal changes are tabulated in the case of 28 eyes with septic endophthalmitis and of seven eyes with chronic endophthalmitis. The 28 eyes with so-called complicated septic endophthalmitis were characterized by at least a small amount of small round-cell infiltration in the ciliary body and choroid together with the exudate of numerous pus cells and macrophages into mainly the anterior or the cyclitic portion of the vitreous. The term chronic endophthalmitis is introduced as a corollary to septic endophthalmitis for the clinical and pathologic diagnosis of eyes showing an exudate into the vitreous that is composed almost altogether of macrophages. The retinal change occurring first in endophthalmitis was perivasculitis. The latter was the source of all the inflammatory round cells that infiltrated the retina and migrated into the vitreous from the retina. In all the eyes tabulated, the macrophage was the predominant cell composing the perivasculitis. Perivasculitis in some degree was present in all but two of the 28 eyes with septic endophthalmitis and in all but two of the seven eyes with chronic endophthalmitis. The number of round cells infiltrating the retina and the number of macrophages from the retina entering the vitreous were generally fewer by far in chronic endophthalmitis than in complicated septic endophthalmitis. The retinal membrane on the inner surface of the retina like the cyclitic membrane was composed of connective tissue produced by fibroblasts that developed from the macrophages in the vitreous. This retinal membrane is more likely to occur in septic endophthalmitis than in chronic endophthalmitis because more macrophages develop in the former.

All the sections of eyeballs and photomicrographs used in this study were prepared in the Laboratory for Ophthalmic Pathology, Washington University School of Medicine.

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OCCUPATION IN RELATION TO CANCER OF THE EYE AND ADNEXA*

With practical points for the ophthalmologist

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The medical literature of Great Britain, France, Germany, and, to a lesser extent, that of America contains articles dealing with occupational cancer. No specific articles on cancer of the eye and adnexa have been found. Kenneway,[1] in an article concerning the anatomical distribution of occupational cancer, found 11 cases of eye and eyelid epitheliomas among 100 pitch workers, and 2 cases among 33 tar workers. Among 38 persons who had 75 cancers due to arsenic only one case in which the eyelid was involved was found.

Among 21,510 patients suffering with neoplastic disease, seeking treatment at Memorial Hospital, New York City, during a period of 13 years, Haagensen[2] found 208 cases of ocular cancer (not all were verified by biopsy).

At the 1936 meeting of the American College of Surgeons the writer presented a report[3] on an occupational study of cancer of the eye, setting forth the results in 1,000 patients. The cases were equally divided between carcinomas and malignant melanomas.

Sources of material

The material used in this study was obtained from the following sources:

(1) From the records of 22 eye clinics in different parts of the United States and Canada.

(2) From the records of four institutions devoted exclusively to the study and treatment of cancer.

(3) From the private records of many eminent ophthalmologists.

(4) From medical services of large industrial plants producing chemicals, oils, carbon products, and gas.

Every case studied has been verified by biopsy or microscopic section of the tumor.

Classification of occupations

More than 154 different occupations were represented in this collection of ocular tumors. There was some difficulty in condensing and grouping such a large number. The following classification was made:

Group I. Occupational groups exposed to oils and lubricants.

Group II. Occupational groups exposed to sunlight.

(1) Occupations with considerable exposure to sunlight and the elements.

(2) Occupations with exposure to sunlight and tar (Group IV, 2).

(3) Occupations with exposure to sunlight, chemicals, and irritants.

Group III. Occupational groups exposed to chemicals.

Group IV. Occupational groups exposed to (1) coal, (2) pitch and tar.

Group V. Occupational groups exposed to radioactive substances as radium and roentgen ray.

Group VI. A large group of miscellaneous occupations such as: Clerical, domestic and personal, construction, engineering, professional, manufacturing, transportation, and trades—affecting

*From the Department of Ophthalmology of the University of Michigan. Read before the Eye, Ear, Nose, and Throat Section of the Tarrant County Medical Society, Fort Worth, Texas, March 4, 1938.

business men, merchants, salesmen, and others.

Group VII. A comparatively small group of workers in metals.

Lack of official occupational cancer statistics

Official occupational-mortality statistics, tables of age distribution in occupations, and cancer-morbidity rates, except those in a few states and the data of the Metropolitan Life Insurance Company are not available in this country. Britten[4] in 1934 made an occupational-mortality cancer report. It concerned men only and covered 10 states. The data were derived from the 1930 United States census material.

Hundreds of records in eye clinics and in ophthalmologists' offices failed to record the occupation of patients, and this is a very important item in a cancer history. In general cancer work it is now recognized that an increased cancer incidence exists in those occupations involving chronic irritation and prolonged exposure to aniline, anthracene, arsenic, creosote, paraffin, petrolatum, pitch and tar, radium and roentgen ray, shale oil, and soot.

Grouping of the cases by neoplasms

The eye records chosen for this study were grouped under the two principal malignant-tumor classifications; namely, malignant melanomas (sarcomas), or the connective-tissue type, and the carcinomas, or epithelial-cell type.

There were 500 cases equally distributed in each classification. Other malignant tumors involving the eye and adnexa are very rare and are of no great importance in an occupational study. Retinoblastomas occur before the eighth year of age, as a rule, and do not present an occupational problem.

It will at once be seen that there is a striking similarity in the occupations, also in the number of cases of each type of cancer in Group I. A total of 37 cases per 1,000 is high. It indicates an increased cancer distribution among those whose occupations exposed them to oils and lubricants (table 1). The general cancer rate is 8 for females and 11 for males per 1,000.

TABLE 1

Occupational group I exposed to oils and lubricants

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Automotive occupations	6	Automotive occupations	9
Machinist, mechanic	6	Machinist, mechanic	6
Mechanical engineer	1		
Oil-station attendant	2	Oil-lubricant handler	1
Plumber, steamfitter	2		
Printer	1	Printer	3
Total	18	Total	19
Total of all cases of both types			37

Oils produced in the United States except in the Middle West oil region where oils have a higher paraffin and asphalt base, do not have such high carcinogenic properties as do foreign oils. American oils contain less sulphur than do foreign oils. Refining in the United States is largely a closed process; the workmen have little contact with the oil. One of the largest oil companies, employing thousands of workers, with records extending over many years, shows a surprisingly small number of cases of cancer of all parts of the body.

Group II may be called the solar group, and it was found desirable to divide it into three subdivisions, as follows: (1) A larger group, composed of semiskilled and unskilled workers, whose occupations exposed them much to sunlight and the elements. (2) A smaller group whose occupations relate to the sea, exposure to sunlight, and to a known carcinogenic agent; namely, pitch and tar of Group

TABLE 2

OCCUPATIONAL GROUP II EXPOSED TO SUNLIGHT

1. A group with considerable exposure to sunlight and the elements

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Engineer, Civil	5		
Farmer (54), Gardener (2)	56	Farmer	23
Governess	1		
Laborer	42	Laborer	14
Mail carrier	3	Mail carrier	2
Peddler	2	Peddler	1
Soldier	2	Soldier	3
		Forest-fire fighter	1
Total	111	Total	44

2. A group with exposure to sunlight, the elements, and to pitch and tar

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Fisherman	2	Fisherman	2
Diver	1		
Dock worker	1		
Sailors—Seaman, Marine and Navy Officers	6		
Total	10	Total	2

3. A group exposed to sunlight, trauma, and chemicals

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Bricklayer, cement worker, and stone mason	3	Bricklayer	2
Carpenter	11	Carpenter	10
Painter	4	Painter	7
Total	18	Total	19

SUMMARY OF DIVISIONS 1, 2, AND 3, GROUP II

	Carcinomas	Sarcomas
Division I Cases	111	44
Division II Cases	10	2
Division III Cases	18	19
Total	139	65
Grand Total of Carcinomas and Sarcomas		204

IV. (3) A third division of only three occupations, skilled in character, where workers are exposed not only to sunlight but also to chemicals and trauma.

Group II has more than 2.8 times (the exact number is 204) the total number of cases found in all the other groups except Group VI, the miscellaneous group.

In Division 1 attention is called to the large number of farmers and laborers having carcinomas, 98 in number. Others in this country and abroad have noted the same thing.[5, 6]

As to Division 3 of Group II, English writers have called attention to the large number of carpenters having neoplasms. Many attribute this to trauma. Our study of ocular cancer does not bear this out. Only one patient in our series gave a history of trauma. We believe the occupational hazard is due to the handling of creosoted shingles, of composition roofing which contains much tar and asphalt, and of building papers, also other lining products many of which are chemically treated. Carpenters are exposed to fine particles of these products in addition to sunlight. Seven carpenters had a basal-cell tumor of the eyelid. Four had a squamous-type tumor. More than half of these men were in the sixth and seventh decades of life and the remainder were between 47 and 52 years of age. Of the malignant melanomas in carpenters, seven tumors were in the choroid, one in the iris, and two in the conjunctiva.

Painters have a potentially increased distribution of ocular cancer. Chrome is a decided chemical irritant and frequently enters into the composition of paints.

A very small distribution of ocular cancer was found among those whose occupations involved a considerable use of chemicals. Some 40 operations, mostly chemical, are used in the process of tanning and preparing leather. Only one leather tanner was found. This patient

TABLE 3

OCCUPATIONAL GROUP III EXPOSED TO CHEMICALS

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Dye worker	1	Chemist	1
Ice manufacturer	1		
Ink manufacturer	1	Leather worker tanner	1
Sulphur worker	1		
Total	4	Total	2

had a melanosarcoma of the choroid which had no possible connection with his occupation.

Arsenic is a chemical which frequently produces malignancies of the skin. This study has not disclosed an ocular neoplasm among arsenic workers or arsenic users.

Our survey material has drawn heavily upon territories adjacent to the three large coal-industry areas of Pennsylvania, West Virginia, and Southern Illinois. The records of eight institutions receiving patients from these coal areas yielded histories of only five coal miners with a cancer of the eye. The literature does not indicate an increase of cancer among coal miners and our data corroborate this.

Concentrated coal products such as pitch and tar derived by distillation of coal are potent carcinogenic agents. Gashouse workers show a rather high cancer incidence in other parts of the body but not in the eye.

TABLE 4

OCCUPATIONAL GROUP IV EXPOSED TO (A) COAL, (B) PITCH AND TAR

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Coal miner	4	Coal miner	1
Fireman, stationary (A)	1		
Official—Coal company	1		
Stone paver (B)	2		
Total	8	Total	1

A definite occupational hazard in the handling and use of radioactive substances has been known for years. Many of the lesions are of a squamous-cell-carcinoma type.

Four eye cases were collected. Three of these had other cancer lesions than those of the eye. One of the nurses had been treated years before for a lupus which involved the cheeks. Protection had not been given to the eyes. She had a squamous-cell lesion of the lower lid. The other nurse had been a handler of radium for many years and developed a lymphatic leukemia with eye lesions. One of the physicians had a basal-cell type of carcinoma involving the face, eyelid, and forearm.

TABLE 5

OCCUPATIONAL GROUP V EXPOSED TO RADIOACTIVE SUBSTANCES, RADIUM AND ROENTGEN RAY

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Nurse	1	Nurse	1
Physician	2		
Total	3	Total	1

On record are now some 150 cases of carcinomatous lesions developing in different parts of the body in workers long exposed to radioactive agents such as roentgen rays[7] and a smaller occupational group of radium workers who have developed osteogenic sarcomas and lymphatic leukemia. The radioactive occupational hazard to the eye does not appear to be very great.

Nearly three fourths of the 1,000 cases fall in Group VI. The occupations in this group are of a more or less sedentary nature. Most of them are indoor occupations without much exposure to sunlight or to known cancer irritants. Many semi-skilled and unskilled occupations as well

as highly skilled occupations are included in this group.

TABLE 6

MISCELLANEOUS GROUP VI CONDENSED DISTRIBUTION OF 50 DIFFERENT OCCUPATIONS

Carcinomas		
Occupation	Cases	
Clerical occupations	4	
Domestic and personal service, housewives (165)	183	
Manufacturing and mechanical	11	
Occupation none, retired, aged	43	
Professions: clergy (9), lawyers (2), teachers (7)	18	
Public service	5	
Students (8), child (1)	9	
Transportation	5	
Trades: business men (4), merchants (4), salesmen (7)	20	
Unemployed	20	
Total	318	
Sarcomas		
Occupation	Cases	
Clerical occupations	12	
Domestic and personal service, housewives (181)	194	
Manufacturing, mechanical	21	
Occupation, none, retired, aged	77	
Professions: clergy (3), lawyers (2), nurses (1), physicians (4), teachers (3), others (3)	16	
Public service	4	
Students (22), child (17)	39	
Transportation	5	
Trades: businessmen (9), merchants (12), salesmen (15)	36	
Unemployed	3	
Total	407	
Grand Total		725

Table 6 shows 89 more cases of malignant melanomas (sarcoma) than carcinomas. The clerical occupations have three times as many cases. The domestic and personal-service occupations show 11 more melanomas. The manufacturing and mechanical industries have doubled the number of melanomas lacking one case. In the student and child group there are over four times as many cases as in the carcinoma group. There are nearly twice as many in the trades as in a similar carcinoma group. In the group designated as "occupation none, retired and aged," there is a large predominance of malignant melanomas. The professions, public service, and transportation groups have nearly the same number of cases in each type of neoplasms.

The unemployed show almost seven times more carcinoma than sarcoma cases. This is accounted for by the much older age incidence of the carcinoma patients.

TABLE 7

OCCUPATIONAL GROUP VII ENGAGED IN METAL INDUSTRIES

Carcinomas		Sarcomas	
Occupation	Cases	Occupation	Cases
Aluminum worker	1		
Brass turner	1		
Dye engraver	1		
Foundryman—moulder	2		
		Gov't mint inspector	1
Grinder polisher	1	Grinder polisher	1
Iron worker	3	Iron worker	1
		Sheet metal worker	2
		Tin worker	1
Total	9	Total	6

This occupational group is not large. There is an increased distribution of cancer of the eye for the group as a whole. Most of the metal industries use one or more chemicals in connection with the manufacture of their products. In certain divisions of the iron industry sulphuric acid is used for bleaching in making gray iron castings. Workers are exposed to frequent splashes. Some of the patients gave a long history of exposure in their work. The tin worker had been employed by the same firm for 20 years.

As a rule it takes from 10 to 15 years' exposure to an irritant before precancerous or cancerous lesions develop.

REVIEW OF THE GROUPS

Table 8 shows four groups which have an increased distribution of cancer of the eye. However, not all the occupations in these groups show an increased distribu-

TABLE 8

SUMMARY OF ALL CASES IN ALL GROUPS

	Carcinoma Cases	Sarcoma Cases	Total cases carcinoma, sarcomas	Percentage per 1000 Cases
Group I—Exposed to oils	18	19	37	3.7
Group II—Exposed to sunlight Divisions 1, 2, and 3	159	65	204	20.4
Group III—Exposed to chemicals	4	2	6	0.6
Group IV—Exposed to coal, tar, and pitch	8	1	9	0.9
Group V—Exposed to radioactive substances	4	0	4	0.4
Group VI—Miscellaneous occupations	318	407	725	72.5
Group VII—Exposed to metals	9	6	15	1.5
Totals	500	500	1000	100.0

tion above that found in the average general cancer rate per 1,000 cases. Occupations in which workers are exposed to oils and having relation to the automotive field show some increased distribution. Printers, plumbers, and steam fitters, who use oils more or less in their work, do not show any such increase. Group II, comprising occupations wherein workers are exposed to sunlight, the elements, pitch and tar, and chemicals, shows a large distribution. Especially to be noted is the large number of farmers and of laborers who form 85 percent of the 155 cases in this group.

In the large miscellaneous group whose workers have more or less sedentary occupations which present no great occupational hazards, there is a rather startling increase, particularly in the domestic and personal-service occupations, more than one third of the entire 1,000 cases being in housewives. Individually the clerical occupations show no increase, but taken as a group they do. Likewise, the manufacturing and mechanical industries as a group show considerable increase. Group VII is a small select group of skilled artisans, mostly the male sex, with no individual increase in cancer of the eye, but the group as a whole shows a slight increase. Another point of interest to the ophthalmologist is the anatomical distribution of the eye lesions, as well as the age and sex distribution.

The anatomical-distribution chart shows that carcinomatous lesions are confined largely to the adnexa and to those parts most exposed to occupational irritants and traumas. A very different picture of the number and of the anatomical distribution of the sarcomatous lesions is seen (table 9).

The average age of the 500 patients having ocular carcinoma was 57.15 years. The average age of those with a similar number of malignant melanomas (sarcoma) was 48.5 years. There were 201 females among the 500 carcinoma cases and 214 among the 500 sarcomas, making a total of 415 in both types of cancer. Of the males we find 299 among the 500 carcinomas and 286 among the 500 malig-

TABLE 9

ANATOMICAL DISTRIBUTION OF CANCER OF THE EYE

Carcinomas		Sarcomas	
Lower lid	149	Lower lid	5
Upper lid	52	Upper lid	5
Inner canthus	90	Inner canthus	2
Outer canthus	32	Outer canthus	1
Other locations about lids	89	Other locations about lids	1
Conjunctiva	46	Conjunctiva	37
Orbit	42	Orbit—primary	50
		Lacrimal	3
		Uvea	
		Choroid	360
		Ciliary body	13
		Iris	23
Total	500	Total	500

nant melanoma cases, or a total of 585 in the 1,000.

It will be seen that there is an excess of 170 males over females; however, five of the seven occupational groups had occupations in which, as a rule, only men are engaged. Much of our material was drawn from large industrial centers, which may possibly account for the predominance in men.

Data on heredity was too incomplete to be of any value, as was also information on the duration of symptoms before treatment was started.

This study brought out the fact that the number of cases of cancer of the eye over a period of 7 to 30 years in many of the clinics shows no increase. The number of cases in each type runs constant. The only rise was in the number of sarcoma cases immediately following influenza epidemics.

The following points should be given attention by ophthalmologists when taking cancer-of-the-eye histories. It is exceedingly important to know how long a patient has followed his occupation. Likewise, whether any other occupation was followed previous to the present occupation and if so, how long that occupation was pursued. These questions often have an important medico-legal bearing. Instances are found in the literature and in this survey material in which a patient suffering with a cancer had changed his occupation. This change in occupation had for a time led to a decrease in the growth. Such a patient should be classified under the primary occupation and is not entitled to compensation.

The exact nature of the duties of the occupation should be noted. Is the patient working more or less constantly with known cancer irritants? A plea is made that every person who takes a cancer history of the eye get a complete and full history of the patient. Details are of importance in solving the cancer problem. Good follow-up records are of great importance in cancer work. Eye clinics, unfortunately almost without exception, have not been in the habit of following up their tumor cases. In the institutions for the study and treatment of malignant disease, the records are far better, and good follow-up work has been going on in many of them for more than five years.

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CONTRAST SENSITIVITY AS A CRITERION OF VISUAL EFFICIENCY AT LOW BRIGHTNESS-LEVELS*

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It is generally conceded by ophthalmologists that visual acuity is the most important ocular requirement for the licensure of automobile drivers, and proposed visual standards are usually based upon this criterion.[1] This conclusion involves the assumption that the determination of visual acuity with test objects of maximal contrast under photopic conditions is appropriate and adequate for the purpose of driver-testing. However, under low brightness-levels, such as exist on streets and highways at night, most hazards are large in size and of relatively low contrast. Therefore, it is interesting to study the individual variations in contrast threshold among motor-vehicle drivers and others subjected to similar conditions. This visual function is not necessarily measurable by the usual techniques of determining visual acuity,[2] as is evident from the data presented in this discussion.

The present investigation of the differences among individuals in the perception of low contrasts under low brightness-levels involved 50 adult subjects of an average age of about 30 years. These subjects possess *binocular*-visual-acuity ratings as follows: 39 subjects with 20/20 vision, 6 subjects with 20/40 vision, and 5 subjects with 20/60 vision. These data were determined with the 1932 American Medical Association chart uniformly illuminated to a brightness-level of about 6 foot-lamberts. This brightness is equal to that of a perfectly white, diffusely reflecting surface under an illumination of 6 foot-candles. Binocular measurements were made as a matter of convenience in accumulating these data, although it was recognized that the usual monocular measurements are preferable in practice. In general, our subjects were free from visual defects arising from pathological causes. However, 26 of the 50 subjects wore eyeglasses, although some of these wore corrections only for near work.

The data of figure 1 show the relationships between measurements of visual function as determined with (1) the 1932 American Medical Association test chart at a distance of 20 feet, and (2) the Luckiesh-Moss Low-Contrast Test chart at a distance of 10 feet. The latter distance was selected merely from considerations of the visibility of the test objects of the low-contrast test chart. The latter consists of pairs of digits of modified Snellen design reproduced in various degrees of contrast with their dull white backgrounds as shown on the right-hand scale of figure 1. These test objects subtend an average over-all angle of about 35 minutes at the test distance of 10 feet. The critical details of the test objects subtend a visual angle of about 7 minutes at a distance of 10 feet. This is equivalent to a 20/140 Snellen rating. However, the size of each digit was individually fixed so that all of the digits used are of the same visibility for the same degree of contrast. Both charts were placed upon a white field approximately 5 by 6 feet and were *uniformly* illuminated to a brightness of 0.01 foot-lambert. This field may be considered as simulating a road surface. A 10-minute period was allowed for adaptation to this arbitrary brightness-level.

* From the Lighting Research Laboratory, General Electric Company.

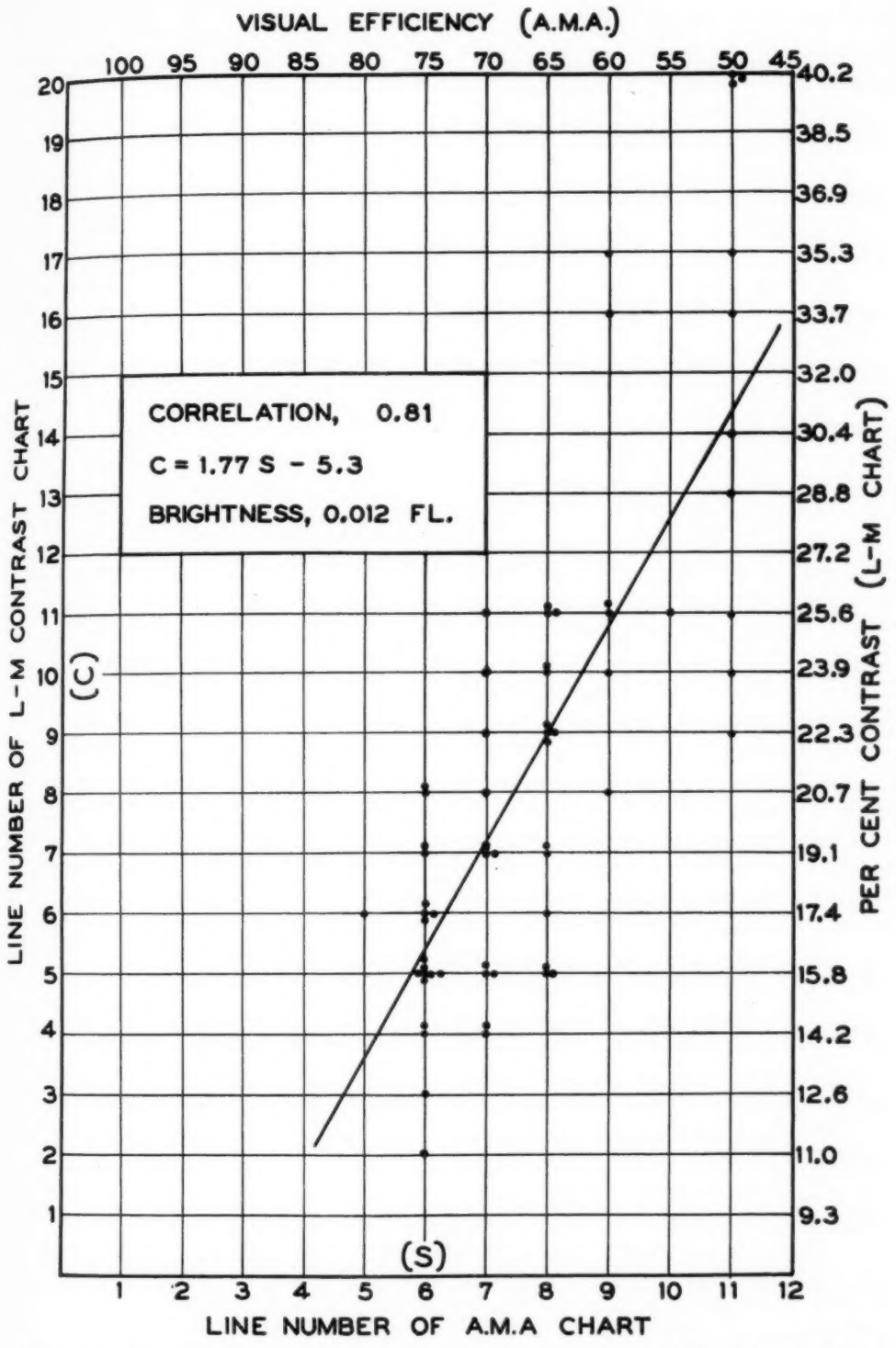

Fig. 1 (Luckiesh and Moss). The correlation between measurements of visual function determined with (S) objects of maximal contrast and various sizes, and (C) objects of various contrasts and constant size.

In general, it will be noted from figure 1 that the subjects possessing the same visual-acuity rating, as measured by the American Medical Association chart, varied rather widely in their ability to recognize the low-contrast test objects of the Luckiesh-Moss chart. For example, the threshold values of contrast varied from 20.7 percent to 11.0 percent for the group of subjects who were able to "read" line 6 of the American Medical Association chart. In this respect, it will be noted that the subject with the best vision among those who were barely able to read line 9 on the American Medical Association chart was visually equivalent to the subject with the worst vision among those who could barely read line 6. Thus many objects on the highway which would be visible to some of these subjects would not be seen by the others.[3] It is also probable that even greater differences in the thresholds of contrast would be obtained among a group of subjects possessing visual defects of a pathological character.

The coefficient of correlation between these two sets of measurements is 0.81. The magnitude of this datum is due to a large extent to the fact that the values corresponding to the lowest degrees of visual efficiency (American Medical Association scale) were obtained for 14 subjects without their usual corrections as well as with them, thus accounting for 64 plotted points on figure 1 obtained from 50 subjects. If the additional 14 sets of data are excluded, the coefficient of correlation is reduced to less than 0.60. This is a statistical indication that the two charts are not equivalent as means for revealing individual differences in visual ability or visual function. In other words, it does not appear possible to use the American Medical Association chart as a substitute for the contrast chart even under low brightness-levels.

At low levels of brightness where contrast perception is a very important factor in seeing, the influence of both "corrective" and "tinted" lenses deserves some consideration. Even clear glasses reduce the brightness of objects at least 8 percent which is sufficient to depress below the threshold of visibility objects which are normally above the threshold. Obviously tinted glasses, which reduce the brightness still more than clear glasses do, will depress additional objects below the threshold of visibility. This applies to windshields as well as to lenses.

Some interesting observations were made pertaining to the effect of corrective glasses on the 14 subjects whose contrast thresholds were determined with and without them. In one case the contrast threshold was appreciably decreased when the subject removed his glasses. In some cases little difference was noted. In others considerable increase in contrast threshold resulted from the removal of the corrective glasses. These are matters of interest in addition to the general application of the criterion of perception of contrast in the determination of visual efficiency, particularly at low brightness-levels. In fact, throughout the realm of seeing, contrast sensitivity is deserving of more attention than it has received.

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TREATMENT OF GONORRHEAL OPHTHALMIA*

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Before the advent of sulfanilamide, the treatment of gonorrheal ophthalmia was long, difficult, and disappointing. An average of 20 days elapsed before the first negative eye smear was obtained, and an average of 27 days was required for the treatment of the active infection. Too often vision was lost or severely impaired.

When reports of the successful treatment of gonorrheal urethritis with sulfanilamide became known, we determined to use the drug in our routine treatment of gonorrheal ophthalmia. Starting in June, 1937, we have had to date a series of 21 patients so treated, in which 18 have responded very satisfactorily with a first negative eye smear in two days, and in which the time of local treatment has averaged 10 days. Of these 18 patients, 10 were adults; two were children, five and nine years of age, respectively; and six were infants under 30 days. In this group, when the cornea was uninvolved on admission, vision was entirely preserved. In no case did corneal perforation occur. All the failures were in infants, two of whom were premature. In this series the number of days of local treatment required for cure is reckoned as the number of days that elapsed before irrigations could be reduced to every three or four hours *pro re nata.*

The treatment may be divided into two parts, local and general; each part is indispensable for best results. The local treatment consists of:

(1) Irrigation of the conjunctival sac every 10 to 15 minutes as long as pus is obtained. As the infection subsides and the formation of pus diminishes, the time interval between irrigations is lengthened. Boric-acid solution or normal saline solution is used for the irrigation.

(2) One-percent atropine-sulfate solution instilled into the conjunctival sac as often as necessary to keep the pupil fully dilated.

(3) Ten-percent argyrol instilled into the conjunctival sac every hour until negative eye smears are obtained. This is probably unnecessary in most cases. We now have five patients, four adults and one infant, treated without argyrol, who have responded just as readily as those who received argyrol. We feel that the use of the mild silver salts can be restricted to the cases that do not respond readily to irrigation and sulfanilamide.

(4) One-percent $AgNO_3$ solution daily or every other day applied with a moistened cotton applicator to the tarsal conjunctiva when it becomes ulcerated and granular. This is used only when the infection has become chronic.

The general treatment consists of sulfanilamide and supportive care. Sulfanilamide is given in doses of 15 grains for every 20 pounds of body weight, divided into six doses and given every four hours. One fourth to one half the 24-hour dose is given on admission. When given subcutaneously a 1-percent solution of sulfanilamide is used: 100 c.c. for every 40 pounds body weight, given every 12 hours. The concentration of sulfanilamide in the blood should be kept above 5 mg. percent. These maximum doses are given until negative eye smears are obtained and the eye is obviously improved. The dosage is then gradually decreased in a period of three days to about one third the original amount and continued on the lowered figure for another 7 to 10 days. This is done to prevent relapse

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When acidosis is impending, sodium bicarbonate is given by mouth in the same dosage as the sulfanilamide. To detect impending acidosis, the urine is checked daily with nitrazine paper. Complete blood counts are made daily the first three days and then every third day to discover any idiosyncrasy to the drug.

The three failures were all in infants. The first was a 4-pound infant admitted with a bilateral involvement of 11 days' duration. Negative eye smears were obtained after 1½ days of treatment, and the baby was discharged as cured on the seventh day, after negative eye smears had been obtained on five successive days. Five days after discharge the mother noted that the eyes were beginning to drain again. On readmission both eyes were again positive for the gonococcus. Upon reinstituting treatment, negative eye smears were obtained in 2½ days, and the infection was promptly cured. We are presenting this case as a possible relapse. It may have been a reinfection from the mother.

The second patient was a 4-pound, 2-ounce baby admitted with an involvement of both eyes of a 1-day duration. Negative eye smears were obtained in 24 hours, and thereafter for five successive days. On the seventh hospital day sulfanilamide was discontinued because of vomiting. That day one eye had a relapse. Sulfanilamide was again started and increased to maximum doses, but this time without success. Not until after 77 days of continuous care was the infection finally cured. By that time the cornea was badly scarred. We feel now that the relapse probably could have been prevented had we continued small doses of sulfanilamide for a few days longer.

The third patient was a 6-pound, 4-ounce baby admitted with a bilateral involvement of 7 days' duration. After 3 days treatment the discharge was markedly decreased, requiring irrigations only once an hour. At that time the sulfanilamide was reduced to one half the original dose. Negative eye smears had not yet been obtained. The eyes promptly became worse. Sulfanilamide was gradually increased to maximum doses, and although the eyes improved, they were not cured. Not until after 47 days was the infection finally stopped. We feel that in this case the blood sulfanilamide was reduced to a low level too soon. This time the end results were more fortunate, however, and both eyes were saved.

Summary

Twenty-one cases of bacteriologically proved gonorrheal ophthalmia were treated with local measures and sulfanilamide. Eighteen responded successfully with a first negative eye smear in an average of two days, and with a local treatment requiring an average of 10 days.

In this group 10 were adults; two were children, five and nine years of age, respectively; and six were infants under 30 days.

In all cases when the cornea was uninvolved on admission, vision was entirely preserved. In no case did corneal perforation occur.

All of the three failures were in infants, of whom two were premature.

Conclusions

(1) Sulfanilamide is of great value in the treatment of gonorrheal ophthalmia when combined with adequate local therapy.

(2) Best results are obtained when a high blood sulfanilamide concentration is achieved early in the treatment and maintained long enough to secure negative eye smears.

(3) Relapse can best be prevented by continuing sulfanilamide in small doses for 7 to 10 days after the first negative eye smear.

LECTURES ON MOTOR ANOMALIES*

VII. Paralyses: General symptomatology

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If, in a case of orthophoria, a single muscle becomes paretic, deviation of the paretic eye in the primary position must take place due to the loss of tonus of the paretic muscle, and the intact tonus of all the other muscles. The deviation of the paretic eye in the primary position of gaze will be either manifest or latent, according to the intensity of the paresis and the function of the paretic muscle. A latent or only temporarily manifest deviation results if, for instance, the internal rectus is weakened, since paretic divergence of not too high a degree can be overcome by a convergence impulse. But even a slight paresis of one of the elevators or depressors cannot be kept latent for the primary direction of gaze and with the head in the normal position, because the vertical range of fusion is very small. That is true only of cases of orthophoria. In a case of heterophoria the paretic deviation is modified by the anomalous position of rest—increased or diminished, or even abolished, or made up of various components—as will be shown presently in discussing the palsies of individual muscles.

If the paresis is the only cause of the deviation, the latter will disappear and the former orthophoria will be restored as soon as the paresis is cured; that is, as soon as the paretic muscle has regained its normal tonus. This cannot happen if the paretic deviation is caused not only by the normal tonus of the intact muscles but also by the development of a secondary contracture of the antagonist of the paretic muscle, due to a change of the former's structure. In such cases a part of the deviation will remain even when the paresis is cured. In any case of typical paresis of a single muscle the angle of deviation increases or decreases according to whether the movement of the eye is in the direction of action of the paretic muscle or of its antagonist. The exceptions to this rule I shall discuss shortly.

The diagnosis of a muscular palsy can easily be made if the movement of the paretic eye in a certain direction is limited. But in many cases of slight paresis there is no such limitation, because the limits of the ocular movements depend not only on the intact function of the ocular muscles but also to a considerable extent on the fascial check ligaments. In order to reach the normal limits of movement in the various directions a maximum innervation is not necessary. A moderate innervation is enough to bring the eyes to the normal limits, which the check ligaments do not allow to be exceeded, except in cases of paralyses in which a structural change of the antagonist of the paralyzed muscle has taken place, due to a long-standing secondary contracture. Therefore, even a paretic muscle can bring the eye to the normal limit by means of an excessive innervation. Hence, as mentioned in the lecture on the physiology of ocular movements (Aug., 1938, p. 851), the uniocular field of fixation is of not nearly so great value for the diagnosis of a slight paresis as is the binocular field of fixation or the field of binocular single vision, the limits of which are nearly identical. According

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to Hering's law of the equal innervation of both eyes, a motor impulse must produce a different effect on each eye if one of the muscles executing the bilateral movement is paretic. From this, a considerable limitation of the binocular field of fixation must result, even if both eyes, tested separately, are able to reach the normal limits of movement. The most important signs of the typical palsies—for instance, the difference between the primary and the secondary deviation, and its increase and decrease in looking in the direction of action of the paralyzed muscle or its antagonist—are derived from the aforementioned fundamental law of association of the movements of the eyes.

We speak of primary deviation if the normal eye is fixating. Secondary deviation is the deviation of the normal eye if the paretic one is taking fixation. The difference between the amount of the primary and secondary deviation is a characteristic of paralytic squint in its first and uncomplicated stage. If, for instance, the right eye is turned in at an angle of 10 degrees because of a paresis of its external rectus, while the left eye is looking at an object straight ahead, the latter will turn in at an angle of perhaps 20 degrees or more if it is covered, and the paretic eye is induced to look at the fixation object. The secondary deviation of the sound eye must be greater than the primary deviation of the paretic eye because the paretic external rectus would not be able to turn the right eye at an angle of 10 degrees from its convergent position into the median position by means of an innervation impulse that would bring about this movement in a normal eye. On account of the paresis, a much stronger dextroversion impulse must be given, to which the paretic eye responds with a movement of 10 degrees, while that impulse, according to the law of equal innervation of the two eyes, has the normal effect on the sound eye so that it moves to the right at an angle of 20 degrees or more. It is easily understood that the more dextroversion is asked of a patient with right abducens paresis, the more will his right eye lag behind the left eye; whereas in levoversion, in which the paretic muscle does not act as agonist, the deviation will decrease. Finally, in the left periphery of the field of fixation, binocular single vision will be possible, either because in that direction of gaze the right external rectus is completely relaxed also under normal conditions, or the fusion tendency may be able to overcome a slight residue of the paretic deviation by means of a compensating divergent innervation. In concomitant squint there is neither a difference between the primary and secondary deviation nor an increase, or decrease, respectively, of the angle of squint in dexto- and levoversion, because the two eyes respond equally to the motor innervations.

The characteristic behavior of the paretic deviation just discussed is frequently missed in later stages of pareses. It is not unusual, in a case of abducens-nerve palsy that is quite typical in the beginning, to find that the difference between the primary and the secondary deviation decreases more or less gradually and at last disappears, the deviation thus becoming no longer distinguishable from a concomitant squint or from a divergence paralysis, particularly as the deviation even in looking toward the side of the paralyzed eye increases just as little as it decreases in looking toward the other side. This behavior can be explained in the following manner: If the paresis of the external rectus muscle improves, while a contracture of the internal rectus is at the same time developing, the deviation does not decrease but extends gradually over the whole field of fixation. In spite of the fact that the external rectus has regained its normal function the de-

viation may be maintained by the contracture of the internal rectus. This contracture, if it is only due to an increased tonus of nervous origin, can disappear in the course of time and binocular single vision can be restored in the whole field of fixation. In other cases the contracture becomes permanent by a gradual change of the muscular structure of the internal rectus. Then a concomitant deviation remains, the angle of squint being approximately equal in the whole field of fixation. I am sure that some cases of the latter kind have been mistaken for divergence paralysis, which is to be discussed later.

The amount of the paretic deviation varies individually within wide limits without being proportionate to the degree of the palsy. The photographs of a person with complete abducens-nerve paralysis show a very small primary deviation (A) and an enormous secondary deviation (B, fig. 20). In contrast to this, numerous

Fig. 20 (Bielschowsky). A, primary deviation is very small in spite of complete left abducens-nerve palsy. B, enormous secondary deviation.

patients with slight paresis display a considerable, even a very high, degree of primary deviation from the beginning of the disorder. These remarkable differences are due partly to individual differences in the general muscle tonus. In cases of an unusually small paretic deviation I have found the tendon reflexes unusually weak; on the other hand, in cases of a strikingly high deviation the reflexes have been abnormally increased. Neurologic examination has confirmed my assumption of an unusually weak or, on the other hand, an unusually increased

Fig. 21 (Bielschowsky). A, right abducens-nerve palsy with an extremely high deviation due to a maximal secondary contracture of the internal rectus which keeps the position of the right eye unaltered in spite of a maximal dextroversion impulse, B.

muscle tonus. However, I do not believe that the degree of paretic deviation depends wholly on the general muscle tonus. Possibly the region and the kind of lesion causing the paresis also influence the degree of the deviation. If a lesion in the nuclear region produces paralysis of the external rectus muscle and at the same time affects the fibers transmitting the impulse of inhibition to the internal rectus so that it cannot relax, one may assume that the paretic deviation will be higher than it would be in a case of basal abducens-nerve palsy, in which the inhibitory impulses going to the internal rectus are undisturbed. But this theory requires still further proof by research. Figure 21 A and B shows an extremely high deviation due to a maximal secondary contracture of the antagonist of the paralyzed muscle.

If a general practitioner is consulted by a patient because of a diplopia of paretic origin, he will not infrequently bandage the sound eye, taking it for the paralyzed one. This mistake is due to the patient's constant use of the paretic eye for fixation. There are several reasons why a secondary deviation takes place at

the beginning of the paralysis: First, the vision of the paretic eye is better, the nonparetic eye being amblyopic; second, since separation of the two images is much greater in secondary than in primary deviation, some patients prefer the former because diplopia is the less disturbing the more the double images are

Fig. 22 (Bielschowsky). Unusual habitual position of the head in a case of inveterate abducens-nerve palsy. While holding the chin pressed against his chest (A) the patient has binocular single vision. Pathologic convergence of a high degree occurs when the head is thrown back (B), while the same distant object is fixated.

separated; and, finally, some patients prefer fixation with the paretic eye because it has been dominant since childhood.

Another characteristic to be met with in all cases of pareses where binocular single vision has been retained in a certain part of the field of fixation, is a habitual anomalous position of the head. This is explained by many authors as an endeavor to make up for the function of the paralyzed or weakened muscle; it is obtained by turning the head in the direction of the action of the ocular muscle before it became paralyzed. This explanation is not invariably correct even for the external and internal rectus muscles, much less for the elevators and depressors. True, in most cases of palsy of the abducens nerve there is a habitual turning of the head to the side corresponding to the direction in which the paretic muscle operates—for instance, to the right in a right abducens paresis, so that the patient looks at an object lying straight ahead with his eyes turned to the left; that is, in the direction in which action of the paretic right external rectus is not called for. Figure 22A shows a patient with abducens-nerve palsy holding the chin pressed against the chest. This position of the head helped the patient to secure binocular single vision, whereas if the head was thrown back (Fig. 22 B) sc that the eyes had to look down, the pathologic convergence present in the primary position of the head was increased to a high degree. Why did not the patient turn his head to the side of the paralyzed abducens nerve? Because, due to the long duration of the palsy, secondary contracture of the internal rectus had set in, and the deviation could not be overcome by looking toward the sound side, as was possible in the early stages of the palsy when it was slight and uncomplicated. On the other hand, it is a physiologic law that the elevation of the eyes favors divergence, just as the downward gaze disposes to converge. Both tendencies are due to the mechanical factors influencing the position of the eyes. With few exceptions, in cases of orthophoria one finds latent divergence when the eyes are looking up and latent convergence when they are looking down. Therefore, in cases of slight or moderate convergence in the primary position of the eyes, the deviation may disappear if the patient looks up or lowers the head, whereas it is increased by looking down, or, on the other hand, throwing the head back. The reverse is true in cases of latent or manifest divergence.

The rule under discussion concerning the so-called vicarious rotations of the head proves to be inaccurate in palsies of a single elevator or depressor muscle

much more frequently than in cases of paresis of the external or internal rectus. It is valid only if both elevators or both depressors of one or both eyes are paralyzed; in such cases the head is rotated around the frontal axis—that is, thrown back or depressed. But in pareses of an individual vertical motor, the position of the head is seldom in accordance with this rule. In cases of trochlear-nerve palsy, for instance, the head is usually tilted toward the shoulder of the sound side and at the same time turned around the vertical axis so that the paretic eye is rotated outward. Indeed, in cases of very slight paresis, the position of the head will show only one of the components just mentioned. If the right superior rectus muscle is paralyzed, the face is often turned only to the right, so that the paretic eye is adverted. How can such a position of the head effect binocular single vision if an elevator muscle is paretic? The vertical rectus muscles have the greatest influence on the vertical movements when the visual line is abverted so that it lies within the muscular plane. The more it moves away from this plane, the more do these muscles lose their influence as elevators and depressors, whereas the influence of the oblique muscles on the vertical movements increases simultaneously in nearly the same proportion. Therefore, a slight vertical deviation due to the paresis of the right superior rectus will disappear if the paretic eye is adverted in consequence of the head being turned to the right.

The rule concerning the vicarious rotation of the head must be modified as follows: The patient chooses the least inconvenient position of the head by which the paretic muscle is sufficiently relieved so that binocular single vision can be obtained.

Another symptom of ocular palsy, called false orientation, is interesting from a scientific point of view, although one can dispense with it for diagnosis. If the patient, while covering his sound eye, is asked to point toward an object situated in front of him or in the field governed by the paralyzed muscle, the finger will point more or less beyond the object and toward the field of action of the paretic muscle. The more the muscle is paralyzed, the more the pointing finger will deviate from the correct position. The origin of this error is obvious: The egocentric (absolute) localization of objects in space is approximately correct as long as the correlation between the innervation of the ocular muscles and its effect is correct; that is, as long as the amount of the actual movement corresponds to that which is intended. But if the right eye is deviated inward, owing to a paresis of the external rectus muscle, and one asks the patient, while covering his left eye, to fixate an object in the median plane of his head, he will have to give a dextroversion impulse, from which he will get the idea that the object to be fixated lies to the right of the median plane. On measuring the error found in the pointing test by a method more exact than this primitive test, one will find that the angle coincides with the secondary deviation; that is, the visual axis of the covered, sound eye is directed to the point at which the paretic eye localizes the fixated object. This behavior is found only in cases of a recent palsy. If the patient is using the paretic eye continually for fixation, the egocentric localization will soon be adapted to the changed relations between innervation impulse and its effect, and the false orientation becomes rectified. But then one will find a different kind of false localization in testing the nonparetic eye while the paretic eye is covered. The patient will point wrongly, but to the

opposite side—that is, to the left—if the normal left eye, which usually is in secondary deviation, is induced to fixate. This kind of false localization is called spastic, in contradistinction to the paretic localization just discussed. Spastic localization is the term for the opposite disproportion between motor innervation and its effect after the innervation in such a case has become adapted to the paresis of the fixating eye, so that it is stronger than is required by a normal

mate information may be obtained about the kind and intensity of the disturbance and so that one may be able to check the reliability of the patient's subjective statements, particularly in the diplopia test. The latter is frequently not necessary for the diagnosis if the objective signs are unequivocal. It is indispensable for obtaining an exact measurement of both the kind and the amount of the deviation in the different parts of the field of fixation; it is the basis for a comparison of

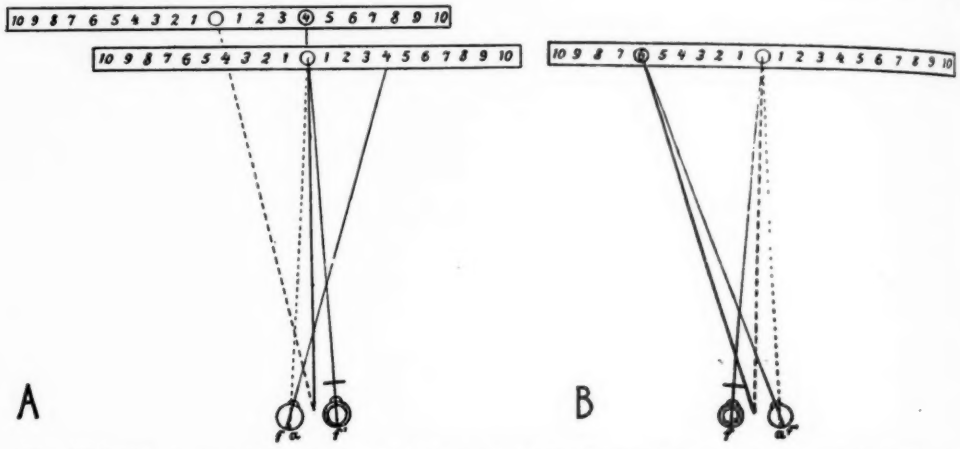

Fig. 23 (Bielschowsky). Diplopia test in a case of left abducens paresis. A, shows the primary deviation while the normal eye is looking through the red glass at the light in the center of the tangent scale. The left visual line is directed to the right number four which, accordingly, is seen to coincide with the red light; the white light being imaged on an eccentric point (α) must appear displaced to the left of the red light at an angle determined between α and the fovea (f). The upper tangent scale in A indicates the displacement as seen by the patient; B, shows the secondary deviation brought about by having the patient's left eye look through the red glass at the fixated light.

muscle for the given amount of movement. Patients with recent paresis suffer more or less from vertigo that is due to the disturbance of the egocentric localization. The patient sees apparent movements of the outlying objects, the double images of which now approach, now separate, according to whether the direction of gaze is outside or inside the field of action of the paretic muscle.

In every case the examination of the objective signs ought to precede that of the subjective symptoms so that approxi-

the first with the later stages of the paresis. The easiest, and also a sufficiently accurate way to examine the double images is the following:

The patient is seated with his head in the normal position facing the light in the center of the tangent scale, which, as a rule, is at a distance of 2.5 meters, on a level with his eyes, and in the median plane of his head. A dark-red glass is put, first in front of the normal eye, then in front of the paretic one. The red glass should be so dark that the eye behind it

sees nothing but the colored light. Suppose a patient with a left abducens paresis has the red glass before his right eye. He sees a red light and a white light. Asked on what number the red light lies, he will say that it coincides with the black number four (fig. 23). Now we know that while the right eye is looking through the red glass at the light the visual line of the paretic eye passes through the right number four—the light and number four being imaged on the two foveæ. Since the patient is sitting at a distance of 2.5 meters from the scale and the numbers correspond to arc degrees at a distance of 5 meters, the separation of the double images amounts to 8 degrees. Turning the patient's head first to the left and then to the right, while he is continually looking at the light, so that his eyes go first into dextro- then into levoversion, he will first see the red light coming nearer, then moving farther away from the white light. In this way the behavior of the double images is tested for the whole field of fixation. Without going into all the details, I will discuss only the influence that the change of fixation has on the diplopia in our case. If the red glass is put in front of the left (paretic) eye the red light will appear on the red number 6. Thus there is again uncrossed diplopia, but the separation of the double images has increased to 12 degrees. This increase is due to the fact that it is the secondary deviation that has just been measured. It is to be borne in mind that in using the red glass or the Maddox rod in the diplopia test and asking where the red light is seen, the fixating eye is the one in front of which the red glass has been put. If the patient with a left abducens paresis is questioned, he will say that the tangent scale is displaced to the left as indicated by the upper scale in A (fig. 23), while the red glass is being held before the right eye; whereas, the scale appears in its right place if he has the red glass before his left eye. The different localization will be understood if one considers that while the sound eye is looking through the red glass, the principal visual direction in which the foveal images—namely, the red light as well as the right number four—are localized, lies in the median plane of the head. If the right number four appears in the median plane the whole tangent scale must, accordingly, appear displaced to the left at an angle of 8 degrees. On the other hand, if the left (paretic) eye is looking through the red glass at the light, it will be seen lying on the left number six, to which the right visual line is directed. Now the visual direction in which the two foveal images appear does not coincide with the median plane because the two eyes are held in the present position by a voluntary levoversion impulse, which is required to bring the normal eye from the primary position to a levoversion of 12 degrees. Figure 24 shows crossed diplopia due to a paretic divergence tested on the tangent scale in the same way as has been described for uncrossed diplopia.

The behavior of the diplopia in the different kinds of pareses may be summarized as follows:

1. Uncrossed diplopia points to a deficiency of one or several muscles with an abverting component, while crossed diplopia points to a deficiency of muscles with an adverting component. In the former group the visual lines converge; in the latter group they diverge.

2. Increase of the lateral distance between the double images in dextroversion is due to a paresis of a dextrovertor of that eye to which the image farthest to the right belongs, that is, the right external rectus if there is uncrossed, the left internal rectus if there is crossed diplopia.

3. Lateral distance is frequently influenced by vertical movements of the eyes since elevation favors a divergent, depression a convergent position of the eyes, due to anatomico-mechanical factors. Hence, crossed double images will, as a rule, move farther apart in the upper, and approach each other in the lower part of the field of fixation, while uncrossed double images will show a decrease of their separation in the lower, an increase in the upper half of the field. A small minority of cases presents the reverse behavior.

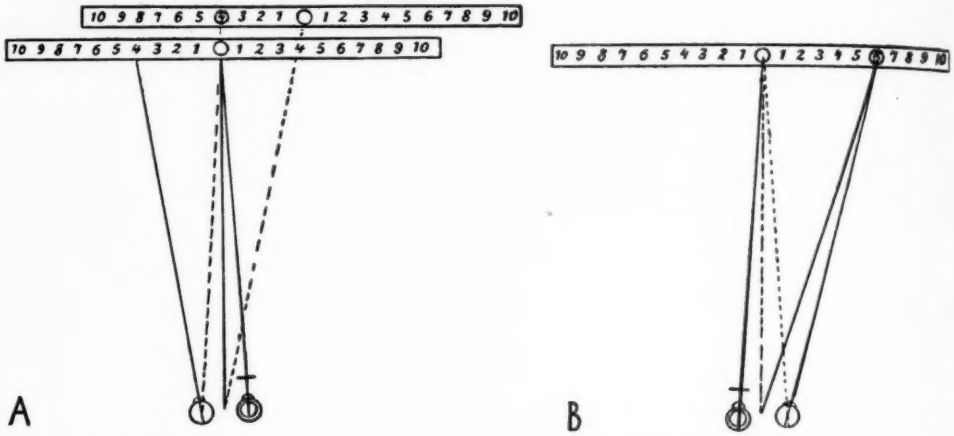

Fig. 24 (Bielschowsky). Crossed diplopia due to a paretic divergence. A, shows a primary deviation of 8 degrees while the normal right eye is looking through the red glass at the light, while in B the secondary deviation (12 degrees) is brought about by the transition of the fixation from the right to the left (paretic) eye.

4. Vertical diplopia with an increasing separation in elevation points to a paresis of one or both elevator muscles of that eye to which the upper image belongs; while the vertical diplopia which increases when the gaze is lowered, is to be attributed to a paresis of one or both depressors of the eye with which the lower image is seen.

5. Vertical divergence increasing in that lateroversion by which the paretic eye is turned out, and decreasing when looking to the opposite side, points to a paresis of one of the vertical recti muscles, while an oblique muscle is concerned if the increase of the vertical divergence is connected with the adversion and the decrease with the abversion of the paretic eye. This behavior is due to the fact that the vertical recti or the oblique muscles act at their best as vertical motors according to whether the eye is turned out, or, on the other hand, turned in, so that the visual line either coincides with or is close to the muscle plane of the vertical recti, or, on the other hand, of the oblique muscles.

6. If the vertical separation of the double images is combined with a minor horizontal component that does not show the characteristics of a paresis of an internal or external rectus, the lateral deviation is not a decisive factor in the analysis of the paretic disturbance, because rather frequently a nonparetic exophoria or esophoria becoming manifest if fusion is broken by the paretic vertical diplopia, may compensate or even overcompensate the slight horizontal deviation caused by a paresis of one of the vertical motors. Thus, for instance, in 25 percent of trochlear palsies one does not find an

uncrossed beside the vertical diplopia, due to the absence of the abverting component of the oblique muscle, but either no lateral separation at all, or even a crossed separation in cases in which an exophoria, latent before the onset of the paresis, has now become manifest. It goes without saying, that the vertical separation of double images also may be due to a nonparetic hyperphoria that has become manifest after the appearance of a paresis of a lateral muscle.

7. An obliquity of one or both of the double images shows that the physiologic parallelism of the corresponding retinal meridians is lost, a phenomenon suggesting that the balance between the muscles with antagonistic rotary components is disturbed. In order to find out whether the obliquity is due to a disclination (extorsion) or conclination (intorsion) of the vertical meridians, the double images should be examined, not in the old-fashioned manner with a candle for fixation, but with a horizontal object; for instance, with the horizontal arm of the tangent scale. The obliquity of the two images of a vertical object like a candle looks quite different according to whether there is, besides the vertical separation, homonymous or crossed diplopia. In spite of the same paretic disclination, the two images (fig. 25) of a candle will converge or diverge upward according to whether there is homonymous or crossed diplopia; in this way a mistake in diagnosis can arise. It is easy to avoid this mistake if one uses a horizontal object in testing for vertical combined with lateral diplopia. In any case of trochlear-nerve palsy, for instance, the paretic disclination makes the double images converge to the paretic side, whether there is homonymous or crossed diplopia besides the vertical separation.

From the obliquity of the double images one can infer only that there is either an abnormal disclination or conclination of the vertical meridians, because of a deficiency of muscles with an inward, or, on the other hand, an outward component. But one does not know which eye is the paretic one, since some patients will see the images aslant that belong to the nonparetic eye; while in other cases both

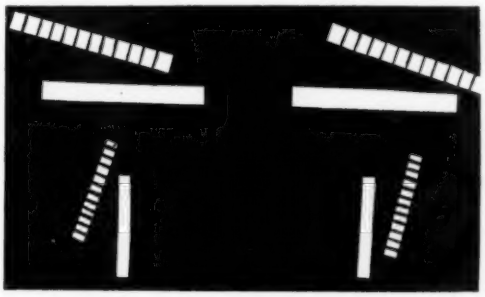

Fig. 25 (Bielschowsky). Different appearance of the double images of a vertical and of a horizontal object in trochlear-nerve palsy according to whether there is, besides the vertical separation, homonymous or crossed diplopia. Though the paretic extorsion is the same in either case, the two images of a vertical object will converge or diverge above, whereas the two images of a horizontal object in such cases will always converge to the paretic side.

images will appear oblique. The former will occur if the paretic eye, being dominant, is used ordinarily for fixation. Then a horizontal contour will appear horizontal to the paretic eye although it is imaged on an oblique meridian, while the nonparetic eye will see that contour aslant despite the fact that its image lies in the horizontal meridian; for as long as the localization of the images of the two eyes relative to each other is dependent on the innate sensorial correspondence, images lying on noncorresponding meridians are localized in different planes deviating from each other by the angle at which those noncorresponding meridians deviate from each other. Since the egocentric localization of outlying objects is not based on innate conditions but acquired during life by daily experiences, it can be adapted to abnormal conditions.

A patient with trochlear palsy, as a rule, will see—while the normal eye is covered—the horizontal and vertical contours of a room as they are, since he knows from experience that, for instance, the contours of the walls or the doors are horizontal and vertical. But if he is examined in a dark room where he sees nothing but a faintly glowing thread, he will see it with the paretic eye either vertical or horizontal only if the position of the thread corresponds to the oblique position of the vertical or horizontal meridian of that eye.

In typical pareses of a vertical motor one knows from the aforementioned data of the investigation, particularly from the fact that the vertical divergence increases either in the upper or lower half of the field of fixation, whether an elevator of the right, or a depressor of the left eye is paralyzed. The obliquity of the image belonging to the paretic eye coincides with the direction in which the horizontal meridian would be rotated by an isolated action of the paretic muscle. A patient with a right-trochlear-nerve paresis, for instance, will see the left end of the lower image of a horizontal contour tipped downward; that is, in the same direction as the horizontal meridian of the right eye would be tipped by an isolated action of the right superior oblique. If such a paresis belongs to those cases in which the paretic eye is used for fixation, the lower image will be seen horizontal, while the right end of the upper image, seen with the nonparetic eye, is tipped down. In either case the right ends of the double images will converge, pointing to a meridional disclination if the lower image is seen with the right eye, while convergence of the left ends would point either to disclination if the lower image belonged to the left eye, or to conclination if it belonged to the right eye.

Further details of the behavior of the double images in the different parts of the field of fixation, as well as with the patient's head in different positions, will be mentioned in the discussion of the pareses of the individual muscles.

RESULTS OF VITAMIN-D–COMPLEX TREATMENT OF KERATOCONUS*

PRELIMINARY STUDY**

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In previous communications[1] Blackberg and I described the consistent production of keratoconus in dogs and rats fed a vitamin-D-deficient, low-calcium diet. The eyes of some of the dogs were enucleated and examined microscopically.

Because of the findings in these specimens, it was thought advisable to treat patients suffering from keratoconus with a vitamin-D and calcium diet.

Eleven patients (18 eyes) were included in this study. Seven had bilateral involvement. Three had a right keratoconus and one a left. The degree of conicity varied from the almost imperceptible to the very marked, with rupture of the posterior corneal layers and central opacity.

Each of the patients was given 60 drops of viosterol[2] after breakfast. More recently however, up to 200 drops have been prescribed. The calcium, taken before the meal, varied with the milk intake. If a patient drank one quart of milk a day, one Mineral Mixture Tablet was given. For each glass less than one quart, two tablets were ordered. So, if a patient drank no milk, he would receive nine tablets daily.

These patients have been observed for varying periods of time, from three months to three years. It will be noticed that in every case there was subjective and objective improvement. Subjectively, the vision improved. Objectively, the improvement was seen by macroscopic, corneal microscopic, cycloplegic refraction, and ophthalmometric examinations. Recently, to be more accurate, plaster-of-Paris casts of the eyes have been used to measure the height of the cones before and after treatment. Twelve molds of six eyes, replicas of the corneas of the eyes of three patients before treatment and three to six months after, were carefully measured by Professor Carlos de Zafra of the engineering department, assisted by Professor Louis Granath of the physics department of New York University. All of the six later molds showed a flattening of the cone. The height of five of these was reduced. One manifested an apparent increase in the height of the cone, but this may not be an actual increase; for it might be mentioned that these cones were measured by taking a chord of the anterior segment of the eyes, using a fixed base line. With shrinkage of the cornea, the base line included a greater portion of the anterior segment. Actually, therefore, the sixth mold also may have a reduced cone. Practically, this may be seen after examining the eleventh patient. Three years ago she presented herself, with palpebral fissures approximately equal in their vertical meridians. In the right eye she had an advanced keratoconus; in the left, a mild myopia. She has been under treatment during this time. For the past year she has been conscious of a ptosis of her right upper lid.

* From the New York Eye and Ear Infirmary and the Montefiore Hospital, through the generosity of the attending eye surgeons of these institutions.

Read before the New York Academy of Medicine, Section on Ophthalmology, December 20, 1937, and the North Jersey Academy of Medicine, Section on Ophthalmology, May 9, 1938.

** The subject matter of this paper is substantially that presented in the June, 1938, issue of The Journal of The American Medical Association. The charts are presented here for the first time.

TABLE 1

DATA ON VITAMIN THERAPY IN KERATOCONUS

Name	Age	Sex	Race	Degree of Keratoconus	Improvement with Vitamin-D-Complex Treatment	
					Subjective	Objective
1. N. L.	39	M.	W.	Marked in O.D. with central nebula. Mild in O.S.	Driving a car at night is much simpler. Spider-web effect of lights not so disturbing. Pins in bowling alley now distinct. Eyes not irritated. Headaches much relieved. Without treatment, symptoms worse.	Height of corneal apex from common base line: Molds: Before therapy After 6 mos. Difference O.D. .1478″ .1448″ 0.0762 mm. O.S. .1262″ .1014″ 0.62992 mm. Cycloplegic refraction: Before therapy, O.D. −11.00 D. cyl. ax. 40° O.S. − 5.75 D. cyl. ax. 140° After 6 mos., O.D. − 9.50 D. cyl. ax. 40° O.S. + .50 D. sph. ≏ −5.75 D. cyl. ax. 140° Corneal microscope—thicker central cornea. Macroscopically—apex of cone less prominent. Vision of O.D. improved from 7/200 to 15/100+ in six months. O.S. from 15/20− to 15/20 with correction: O.D. from 15/100+ to 15/50− O.S. from 15/15− to 15/15
2. F. C.	23	F.	W.	Marked in O.D. Moderate in O.S.	Vision definitely clearer.	Height of corneal apex from common base line: Molds: Before therapy After 3 mos. Difference O.D. .1359″ .1307″ 0.13008 mm. O.S. .1356″ .1154″ 0.51308 mm. Corneal microscope—denser cone. Macroscopially—cones lower and flatter. Vision O.D. without correction 20/100; after 3 mo. 20/50− O.S. without correction 20/100; after 3 mo. 20/50
3. S. S.	37	M.	W.	Marked in O.U.	"Eyes altogether different now. Eyes used to shake, and almost blind. They are not so weak any more." Sees and picks up pickles with greater ease. Clock observed at further distance.	Height of corneal apex from common base line: Molds: Before therapy After 3 mos. Difference O.D. .1206″ .1104″ 0.25908 mm. O.S. .1296″ .1365″ 0.17526 mm. Corneal microscope—hyperbolic curves less acute. Macroscopically—cones flatter, with radius of curvature more uniform.
4. A. D.	25	F.	W.	Marked in O.D. with central macula Mild in O.S.	Doesn't bump into doors and things now. Doesn't get things in eyes. Able to play cards now. Letters are more distinct—previously had lines running up and down. Pictures are not "cockeyed." Eyes are not "stiff." Formerly could not read nor sew at night with any comfort. Easier to dance.	Cycloplegic refractions: Before therapy, O.D. unimproved O.S. +.25 D. sph. ≏ −1.75 D. cyl. ax. 105° After 10 mos. O.D. unimproved O.S. +1.00 D. sph. ≏ −2.00 D. cyl. ax. 95° Corneal microscope—thicker central cornea. Macroscopic improvement—lower and flatter cones. Vision O.S. with correction 20/30−; after 10 mo. 20/20.
5. A. S.	60	M.	W.	Marked in O.U. with corneal maculae.	Vision improved. No more pain in eyes.	With correction Before, O.D. −2.00 D. sph. ≏ −.50 D. cyl. ax. 75° = 20/70− O.S. −1.50 D. sph. ≏ −1.00 D. cyl. ax. 180° = 20/70− After 6 mos., O.D. −4.50 D. sph. ≏ +9.00 D. cyl. ax. 172° = 20/50 O.S. −10.50 D. sph. ≏ −5.50 D. cyl. ax. 75° = 20/50 Corneal microscope—thicker membrane. Macroscopic improvement comparatively marked.

TABLE 1—*Continued*

Name	Age	Sex	Race	Degree of Keratoconus	Improvement with Vitamin-D–Complex Treatment	
					Subjective	Objective
6. M. B.	32	M.	W.	Normal O.D. Mild in O.S.	Sees better. Eyes less tired.	Vision of O.S. improved from 10/200 to 20/100 in 8 mos. Cycloplegic refraction: Before, −3.00 D. cyl. ax. 70° = 15/200 After, + .75 D. sph. ⊂⊃ −2.50 D. cyl. ax. 75° = 20/70 Corneal microscope—denser membrane. Macroscopically improved, with flatter cone.
7. V. P.	37	F.	W.	Mild in O.U.	Vision clearer and better. No more distortion of objects, as believing that a man crossing the street was riding a bicycle, or mistaking a lemon for an orange. Does not "squint" now and eyes do not tear. Does not have headaches after movies now. Symptoms returned when patient was without medication for 8 weeks.	Vision O.U. improved from 20/200 to 20/100 in 7 mos. Cycloplegic refraction: Before, O.U. −1.00 D. cyl. ax. 90° = 20/70 After, O.D. + .25 D. sph. ⊂⊃ −1.00 D. cyl. ax. 40° = 20/40 O.S. + .50 D. sph. ⊂⊃ −1.00 D. cyl. ax. 90° = 20/30 Corneal microscope—denser central membrane. Macroscopic improvement.
8. C. P.	20	F.	W.	Mild in O.D. with leucoma (esotropia and lens opacity)	Painful and tearing eyes improved. Vision slightly better.	Cycloplegic refraction from −10.00 D. sph. to −8.00 D. sph. ⊂⊃ −1.00 D. cyl. ax. 15°, in six months. Corneal microscope—thicker central membrane. Macroscopically—less prominent and flatter cones.
9. M. C.	43	M.	W.	Mild in O.D. Moderate in O.S., with central nebula	Vision much clearer. Faces and objects more distinct. Worse without medication.	After 2 years, ophthalmometer shows astigmatism of O.D. to be more regular. Corneal microscope—thicker central membrane. Macroscopically—less prominent and flatter cones.
10. E. W.	29	F.	W.	Marked in O.D., with central macula. Moderate in O.S.	Vision improved. People in moving pictures much more distinct. Able to sit further back in theater. Reading and sewing done with greater ease.	Vision improved O.D. 5/200 to 15/200 in 7 mos. O.S. 15/200 to 15/70 Cycloplegic refraction: Before, O.D. unimproved 5/200 O.S. −1.00 D. sph. ⊂⊃ −7.00 D. cyl. ax. 85° = 15/100 After 7 mos., O.D. −1.25 D. sph. ⊂⊃ −8.50 D. cyl. ax. 100° = 15/100 O.S. − .25 D. sph. ⊂⊃ −7.00 D. cyl. ax. 85° = 15/50 Corneal microscope—thicker central membrane. Macroscopically—cones less prominent and flatter.
11. B. M.	34	F.	W.	Marked in O.D., with central macula. Absent in O.S.	Drooping of right upper lid.	Pressure bandage and simple iridectomy of no avail. After 3 years' therapy conus has diminished greatly. There is a ptosis with a narrowed palpebral fissure. The cornea is smaller, with an excess of tissue heaped up in the central vertical meridian, over the former site of an epithelial cyst. Corneal microscopy—thicker central cornea.

In all probability, this ptosis is due to a shrinkage of the cornea, as well as of the sclera. For, as will be shown in a later paper, the sclera, too, may shrink.

Conclusion

From the foregoing data, it may be concluded that the vitamin-D complex has a definite place in the therapy of keratoconus. Further research will determine its proper position in the therapeusis of this condition.

Miss Diana Shrage of the New York Eye and Ear Infirmary assisted in this work. Products used in the study were supplied by the Mead Johnson Company of Evansville, Indiana.

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[2] Mead Johnson Company's products: Viosterol: One gram contains not less than 10,000 vitamin-D units (U.S.P.), 40 drops to a gram. Mineral Mixture Tablets, No. 85; Composition: alfalfa ash 45 percent, dicalcium phosphate 32 percent, edible bonemeal 64 percent; analysis: moisture 2 percent, protein 6 percent, fat 2 percent, minerals (ash) 90 percent, each tablet supplies calcium 140 mg., phosphorus 83 mg., iron 1 mg., copper 0.05 mg., magnesium 2.8 mg., sodium 5 mg., potassium 5 mg.

PROBLEMS IN THE DIAGNOSIS OF ABSCESS AND TUMOR OF THE ORBIT*

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Whenever it becomes necessary to determine whether a pathologic condition within an orbit is due to abscess or tumor, consideration of certain factors becomes of decisive importance. The problem of distinguishing between these two pathologic processes is complicated by the fact that the outstanding signs and symptoms, which are common for both conditions, are also found in aneurysm of the ophthalmic artery, in cavernous-sinus thrombosis, in pseudotumor, and in orbital complications of Hodgkin's disease, tularemia, Parinaud's conjunctivitis and other local or systemic diseases, or following trauma. Obviously the diagnosis is not always clear by inspection alone. The history of the onset and progression of symptoms is of equal importance to the status prior to the beginning of noticeable changes and to the physical findings of a corroborative nature. The differentiation hinges on the history, physical findings, functional changes, response to treatment, and, finally, on histopathologic examination.

It is not often that one is called on to utilize all or even most of these factors to distinguish between orbital abscess and orbital tumor. In the majority of cases the evidence in favor of one or the other condition is so marked that only one probable diagnosis can be substantiated. Acute cellulitis that subsides with the formation of a palpable, fluctuant mass points only to an accumulation of pus and débris. The chance that any other pathologic condition may also be present is unthinkably rare, although the possibility must not be lost sight of, because the unfortunate incising of an aneurysm under the impression that an abscess was being drained has led more than one surgeon to regret his action.

Acute cellulitis may arise from localized periostitis within the orbit, and, when situated along the roof of the orbit, the differential diagnosis becomes of importance because of the proximity of such a lesion to the brain. Most suppurative lesions of the orbit, whether originating in periostitis, invasion from infected

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sinuses, or from introduction of foreign bodies from without by penetrating injuries, tend to become walled off by a surrounding infiltration and gradually work toward the orbital outlet, where they point in the lid, open, and become fistulous tracts. The anatomic structure of the orbit permits three potential spaces for abscess formation: (1) between the bone and periorbita, particularly along the roof; (2) between the periorbita and the muscle cone, and (3) within the cone itself. Of these potential spaces, orbital abscesses are found most frequently in the one first mentioned, for the reason that most of them are due to lesions that invade the orbit from without; that is, from the frontal or ethmoidal sinus. Consequently, in the absence of localizing signs, exploration of the orbit for relief of abscess should be directed toward the roof between the bone and the periorbita. Incision should be made through the skin of the lid just beneath the brow and the superior orbital margin.

It is fortunate that neoplasms of the orbit do not break down into cystic masses and that chronic inflammatory lesions of the orbit seldom take on malignant characteristics. With the exception of mixed tumors of a low grade of malignancy and some of the mixed basal-cell and squamous-cell carcinomas, neoplasms of the orbit, both primary and metastatic, increase in size along directions of least resistance and without signs that are indicative of abscess formation. However, in a case of extensive melanoma of the orbit which required exenteration, I found that the posterior third of the orbit contained only a thick black fluid with degenerated tissue débris, in many respects the complete counterpart of a cold abscess. This patient had deeply pigmented pharyngeal, nasal, and buccal mucous membranes without characteristic signs of malignancy and is alive and well more than 10 years after the exenteration.

Exophthalmos is the outstanding indication of increased mass within the orbit and is present as the first sign in most diseases of the orbit. The bony walls of the orbit offer resistance to the expansion of a new growth or abscess, to an increase in the size of an aneurysm, or to the edema of orbital tissues in goiter; as a result, the membranous anterior wall gives way, permitting the eyeball to move forward. There are two elements in exophthalmos that are significant, the rate of progress and the lateral or vertical displacement.

If fluid is injected into the orbit, the eyeball moves slowly and steadily straight forward and becomes fixed and immobile. The dispersion of the injected fluid within the orbit is not impeded, and the eyeball moves forward without lateral displacement. I have seen one case of traumatic arteriovenous aneurysm of the orbit in which the history of the development of the exophthalmos was very important. A child's right orbit was injured by a pitchfork tine when the child slid down a haystack. On examination at the clinic several days later, the eyelids were markedly edematous and discolored, the conjunctiva congested and chemotic, the eyeball pushed forward and immobile, and the cornea clear; vision was 6/10 without glasses. There was little pain or tenderness. A slight thrill synchronous with a slight bruit pointed to arteriovenous aneurysm, but whether they were the result of direct injury or of subsequent erosion through suppuration was the question. The child had no fever and the blood count was normal. The most significant factor, to my mind, however, was the statement in the history that, immediately after the injury, the proptosis of the eyeball and swelling of the lids was as great as it had been at any time since, the only change in the picture having

been the congestion of the conjunctiva and discoloration of the eyelids which developed slowly afterward. As there were no definite signs of infection, exploration was not indicated. A mild pressure bandage worn for a few weeks was sufficient to bring about complete recovery. The proptosis was due to extensive hemorrhage from a wounded orbital vessel, probably an artery, because pulsation of the proptosed eye was visible for several weeks. This seems to indicate that fluid within the orbit, whether from an external or internal source, if unimpeded by artificial barriers will become evenly dispersed and produce proptosis without lateral displacement of the eyeball.

The contrary condition is found in the case of very slow-growing tumors of the bony walls of the orbit. Osteomas do not grow in the direction of least resistance. They invade the orbit or the cranial cavity, or the bony framework of the face or head, without regard to resistance. Osteomas of the orbit arise within a paranasal sinus and are always covered by a mucous membrane continuous with the lining of the sinus of origin; by continuous expansion the cavity becomes filled with a bony tumor. Barriers, of whatever nature, are eroded by pressure of the advancing osteoma, but the adjustment is so slow that external deformity is a late manifestation and proptosis is seldom extreme. Lateral displacement of the eyeball is quite marked, however, if the osteoma is in the anterior third of the orbit, less so if the tumor is in the middle or posterior third. Furthermore, a slow rate of growth of either a tumor or an abcess permits adjustment within the orbital tissues, so that proptosis develops only after the mass has reached considerable size, and then it progresses less rapidly.

For a given amount of increased mass within the orbit, proptosis is developed in proportion to the rate of increase in the mass. From this generalization one may infer that the size of a tumor or abcess cannot be estimated with even fair accuracy by the extent of proptosis alone, and that the duration (or age) of a slow-growing tumor can be estimated only approximately by the onset of proptosis. Tumors and abscesses act in a similar manner to produce exophthalmos, and differentiation of the two conditions cannot therefore be made on the basis of the proptosis alone. This applies particuarly to cold abscesses and localized inflammatory masses due to tuberculosis and to syphilitic periostitis and gumma.

Rapid swelling of the tissues of the orbit, accompanied by proptosis, pain, tenderness, and loss of mobility of the eyeball in a person with arthritis, gout, or other constitutional disorders of metabolism, may be suspected to be cellulitis of the orbit; this may lead to abscess or to localized hemorrhage accompanying thrombosis of an orbital vein. Vascular accidents occur along the sheaths of the optic nerve and give rise to retinal venous engorgement and edema of the disc and adjacent retina without producing scotomas or other visual impairment. Also, along the tendons and, indeed, throughout the orbit, hemorrhages frequently appear and are absorbed without attracting attention; subconjunctival hemorrhages are as a rule no more significant. Hemorrhages within the orbit are seldom of importance either as primary lesions or as complications of injury. A ruptured sacculated aneurysm will heal spontaneously with the aid of a compression bandage.

Exophthalmic goiter frequently is a most difficult condition to demonstrate and is therefore one of the greatest stumbling blocks to a correct diagnosis of orbital tumor. Exophthalmos is present in only about a third of the cases in which

there is moderate elevation of the metabolic rate; it is frequently a delayed sign of the disease, coming on only after the metabolic rate has receded and after other signs of the disease have disappeared. Exophthalmos may appear as the only sign of toxic goiter, and as it may appear in one eye only, the cause of the exophthalmos may be in doubt. Operation on the orbit under such conditions has been carried out in a number of cases but with negative results. On finding no pathologic changes in the orbit, the condition in such cases has been erroneously classified as "pseudotumor" of the orbit. That name does not apply to such conditions as are found in goiter and should be reserved for a particularly definite pathologic condition which I have described elsewhere. Not many cases of exophthalmic goiter will be missed if the basal metabolic rate of all persons with noninflammatory exophthalmos is determined. An increased metabolic rate is pathognomonic of hyperthyroidism, although a low rate is not sufficient evidence to reject a diagnosis of previous hyperthyroidism. The sequelae of hyperthyroidism, particularly exophthalmos without an increased metabolic rate, must not be overlooked.

I am inclined to believe that, in the past, the condition has in many cases been erroneously looked upon as syphilitic because the proptosis and swelling responded to treatment with iodides. The diagnosis of syphilis in orbital disease has waned, however, as biologic tests for syphilis have become more reliable and as means of recognizing disturbances of the glands of internal secretion have become more widely known. The therapeutic use of iodides has taken on a deeper significance as well. A trial of medical measures, probably combined with the use of irradiation, will bring about satisfactory results in a large number of suspected cases of orbital tumor and abscess. Only the etiology and true nature of the process will remain in obscurity.

The use of roentgenograms for the diagnosis of orbital tumor is now universal; at least in no case would roentgenography be omitted. The interpretation of roentgenograms, however, requires skill and wide experience. We have all seen the folly of operating solely on the basis of the roentgenographic evidence and we have all felt keen disappointment at the failure of some suspected condition to show up in the roentgenogram. Negative roentgenograms are often dangerously misleading, particularly in cases of meningioma and hemangioma, and a sense of false security may be engendered by a poorly made or misinterpreted roentgenogram. In only one condition do I have complete confidence in the roentgenogram, and that is in osteoma. A diagnosis of osteoma in the face of negative roentgenograms cannot be justified, yet I have known this error to be made many times. The reason for the mistake is obvious. A soft-tissue tumor or a cyst situated anteriorly so that it can be palpated near the rim of the orbital outlet will usually seem to be quite hard, unyielding, immovable, and not tender. The continuity of bone seems quite evident and the tumor seems definitely limited. Such tumors are usually encased in a tight-fitting, tense capsule, and while inside they may be of a soft consistency or even fluid, they are unyielding to pressure and are immovable; this gives the impression that what is felt is a bony tumor. If a roentgenogram fails to show definite bony growth it is not likely that an osteoma is present. Palpation is not trustworthy evidence on which to base a diagnosis of orbital tumor.

What I have considered thus far refers to occult orbital tumors or abscesses. The same general conclusions may be applied

if I should include cysts, mucoceles, meningoceles, and pyoceles. Not only must the presence of any of these pathologic conditions be diagnosed by indirect evidence, but their situation, size, age or duration, and histopathologic nature must be inferred. The clinical picture is a composite one of all the signs and symptoms that can be elicited, viewed in the light of a well-derived history. If the diagnosis is not clearly established, the indications may point to medical treatment, watchful waiting, and consultation, but seldom to surgical exploration. Aspiration may be employed under proper safeguards, but operative interference is justified only on clear-cut evidence of definite pathologic changes or after failure of relief by nonsurgical treatment, and then only under strictly aseptic precautions. So many patients with suspected occult tumor have been entirely relieved by nonsurgical measures, with such little risk of permitting a bad condition to grow worse, that I advise, teach, and practice conservatism in such cases.

As against the occult tumor of the orbit there is the superficial cancer of the eyelids or conjunctiva that invades the orbit by direct extension. In these cases there may be no doubt of the diagnosis, but it may be difficult to determine whether and to what extent the orbit has become involved. Basal-cell cancer of the lid does not metastasize but grows by direct extension, usually toward bone. Originating in the deeper layers of the skin, the malignant growth extends in all directions with sloughing or ulceration only on the surface. As the advancing edge of the rodent ulcer breaks down and the part first affected tends to heal, there is a deeper process that does not break down and heal but continues to send fingerlike projections through the indurated substrata. When bone is reached, extension proceeds rapidly beneath the periosteum, the tumor becomes fixed, and the situation becomes grave. A fixed or immobile basal-cell epithelioma is a potential orbital tumor and must be dealt with accordingly.

Compared to basal-cell cancers, squamous-cell cancers are doubly dangerous because of their greater malignancy and tendency to metastasize. I have not been impressed by the reputed healing of superficial basal-cell cancers by the application of mild heat or violet rays. Such measures may induce surface healing, and for a time the result may seem satisfactory, but recurrences are the rule. Like an iceberg, about four-fifths of the mass is below the surface, and the deeper cancer cells are not obliterated. Basal-cell carcinomas are of a low grade of malignancy and may lie dormant or grow imperceptibly. They seem to be more formidable when situated near the canthi, and I believe it is because, in these regions, they have easier access to bone. When they do invade the orbit, only extensive exenteration will arrest them.

Another difficult problem in the diagnosis of orbital tumor is presented by the melanomas. I shall not speak of the intraocular melanomas, as their significance is obvious. Pigmented nodules of the lids and lid margins and of the caruncles are mostly benign nevi and comparatively seldom take on malignant characteristics. On the conjunctiva, however, pigmented lesions of any size are abnormal and very frequently they undergo malignant change even after many years of quiescence. Melano-epitheliomas of the conjunctiva grow fairly rapidly and give rise very early to hematogenous metastasis. From a single pigmented spot in the conjunctiva, multiple areas will rapidly arise nearby, being deeply pigmented from the start. The tendency to direct extension into the orbit is almost negligible. Seldom does one see a mass of proliferation come from the conjunctiva; instead,

there will be seen a widespread pigmentation with congestion and thickening of the conjunctiva resembling a low-grade inflammation. There are no lymphatic structures within the orbit and the lymphatics of the lids and conjunctiva drain away from the orbit, which accounts for the low incidence of orbital involvement and the high incidence of metastasis to other parts of the body. At biopsy it is well to bear in mind that local recurrences and remote metastatic lesions of melanomas primary within the eyeball frequently are nonpigmented.

A condition of the orbit characterized by mild swelling of the lids, mild chemosis, and exophthalmos, all slowly progressive without pain or fever, is oftentimes referred to as "pseudotumor of the orbit." The reasons for the appearance of the signs of intraorbital disease do not become clear, and one is confronted with the necessity of remaining in ignorance of the true condition while watching its progress, or of exploring the orbit. Obviously, paracentesis and aspiration are useless. Biologic tests for syphilis and tuberculosis give negative results, and roentgenograms of the head are negative. Tenderness on palpation may be present or absent, but definite signs of abscess or tumor are wanting. When the orbit is thoroughly explored, a tumor, or abscess, or cyst is not found. The pathologic report on the tissue removed is "chronic inflammation." The orbit is closed and the condition subsides. Such a history may apply to several of the comparatively rare conditions of the orbit: chronic inflammatory pseudotumor, Mikulicz's disease, lymphoma, vascular tumors, leukemic and pseudoleukemic tumors, the chloromas, and inflammation of tuberculous character.

The chances of obtaining satisfactory information from biopsy would hardly justify the procedure, as only thorough digital exploration would reveal a mass in the posterior third of the orbit. Unless exploration can be thorough and unless adequate surgical correction can be carried out immediately, surgical intervention should not be attempted.

In the absence of corroborating constitutional signs of systemic disease, so long as the etiology of pathologic changes in the orbit remains in doubt I would urge observation under whatever nonsurgical form of treatment would seem to offer the best results until a definite distinction between malignancy and inflammation can be made.

NOTES, CASES, INSTRUMENTS

NEVUS FLAMMEUS AND ARRESTED HYDROPHTHALMOS

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P. S., aged 42 years, a Lithuanian laborer, came to the North End Clinic on March 14, 1938, complaining of difficulty in obtaining gainful employment due to poor vision in the left eye. He stated that he never remembered having been able to see more than shadows out of his left

Fig. 1 (Davies). Nevus flammeus and arrested hydrophthalmos.

eye and that a birthmark on the left side of his face had always caused him considerable embarrassment. The past history was essentially negative except for the duration of the present complaint. There was no history of epileptiform seizures.

Examination revealed a nevus flammeus involving the nose, upper lip, and cheek, and upper and lower eyelids on the left side, which gradually faded off in the temple region as shown in figure 1. The left eye was divergent about 15 degrees as measured in the Priestley-Smith manner. Vision was 20/20 in the right eye and only the perception of light in the left eye. Both the external eye examination and the fundus study were essentially negative on the right side. The left eye was slightly larger than the right. The conjunctiva was definitely involved by the nevus with considerable dilation of the anterior ciliary arteries. About the limbus there was increased vascularity with many fine bulbous enlargements of the vessels. The cornea of the right eye measured 11 mm. in diameter and of the left 13 mm. The anterior chamber and iris were negative. Pupils were equal and active. Fundus examination of the left eye revealed the disc to be oval vertically, markedly atrophic, and with deep glaucomatous cupping. The arteries and veins were small. The macula was negative. Intraocular tension (Schiötz) measured 19 mm. Hg in the right and 20 mm. in the left eye. Prolonged dilation over a period of two weeks with atropine sulphate 1 percent did not increase the tension. Fields were normal in the right eye but were not obtainable in the left due to poor vision. No evidence of angioma of the choroid was seen. Roentgenograms of the skull were negative. The blood Kahn test for syphilis was negative. The physical and neurological examinations were otherwise negative.

This is a case of unilateral nevus flammeus associated with glaucomatous cupping of the disc, atrophy of the optic nerve, increase in size of the cornea and eyeball without increase in intraocular tension. This case, it would seem, could be classified as one of arrested hydrophthalmos.

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TREATMENT OF TRACHOMA WITH SULFANILAMIDE

A PRELIMINARY REPORT*

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According to findings of Loe (which were confirmed by Richards**) sulfanilamide effects an arrest of trachoma in about three weeks. Thereafter the improvement is said to continue without further medication. Based on their methods of administration and dosage, the drug was tried on 25 white patients of the Southern Illinois Trachoma Clinics. These patients were selected because they showed signs of "active" trachoma.

Each patient received one-third grain of sulfanilamide a day per pound body weight for a period of one week. In the second week the dose was reduced to one-quarter grain a day per pound body weight. Patients who showed objective or marked subjective symptoms due to toxicity of the drug received a reduced dose, or the medication was interrupted for two to four days.

In order to give a clear picture of the result of the treatment during two weeks' medication and observation, it is necessary to divide the cases into four groups. In the first group were children between 5 and 14 years of age who had no, or only very slight, subjective symptoms and normal vision. Their conjunctiva showed no signs of acute inflammation, but there was dense folliculosis in the fornices. These follicles were distinct, rather prominent, and of equal size. The conjunctiva, especially over the tarsal plate of the upper lid, was not injected and did not show secretion. The pannus in this group was just developing, or its existence was questionable. These cases, border line cases of follicular catarrh, did *not* show definite improvement after two weeks.

In the second group there were 11 patients classified as "trachoma stage 2-A with succulence." These patients complained of slight photophobia, epiphora, various degrees of blepharospasm, and diminution of vision. Objectively, a velvety conjunctiva with imbedded small follicles was observed. There were various degrees of succulence. The granules were not so prominent and distinct as in the first group. The appearance of the conjunctiva was somewhat muddy and indistinct. There were 2 to 4 millimeters of active pannus in most cases. Cases belonging to this group showed improvement after treatment with sulfanilamide. The most outstanding subjective symptom was a diminution of the epiphora, which was noticed on the second day after beginning medication. A few days later the blepharospasm and the photophobia improved, and the vision, which was usually reduced, ranging from 20/40 to 20/200, improved about two lines on the Snellen chart. Objectively the conjunctiva looked dryer and paler, and the granules decreased in size. The velvety appearance was diminished on the sixth day. On the seventh day the presence of normal blood vessels was observed on the conjunctiva over the tarsal plate of the upper lid, a region which showed the first and most marked signs of objective improvement. The vessels of the pannus became thinner and less distinct on about the tenth day after the treatment was begun. However, they did not disappear during the course of observation. At the end of two weeks the granules in the conjunctiva were still present, but less distinct, the conjunctiva itself was smoother, the velvety appearance was gone. About

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*From the Governor Horner Trachoma Clinics of Southern Illinois, Dr. Harry S. Gradle, Director.

**Richards. Personal communication from the U. S. Indian Service to Dr. H. S. Gradle.

75 percent of the patients of this group felt unquestionable improvement in their eyes. Among them is a patient who suffered from an acute flare-up which started two months previous to the sulfanilamide treatment. Another patient had had photophobia for one year, and was without treatment during that period. He improved rapidly within a few days after sulfanilamide medication.

The third group included patients who had trachoma stage 3 without too malignant sequelae due to the disease. Their conjunctiva showed velvety patches and scarring. There was a slight degree of succulence and considerable pannus. Granules in this group were absent. These patients also showed improvement. Their lids looked paler and smoother after a course of two weeks, and the vision improved, due to a slight clearing of the pannus. In this group the sulfanilamide seemed to moderate the course of the disease and to bring it closer to stage 4.

In the fourth group were three patients who, for the past years, had had very active and malignant forms of trachoma. They had suffered repeatedly from flare-ups, and had vision of less than 20/200, due to marked scarring of the cornea, active pannus, and blepharospasm. They were also classified as stage 3, but the conjunctiva lacked the velvety patches. Instead it was dark red, hypertrophic, and smooth, and the tarsus was very markedly thickened and deformed, due to scars. The blood vessels of the pannus were very thick, and the whole picture was that of a malignant type of trachoma, even though active granules were not present. These patients showed, aside from a very slight paling, only little response to the drug, and their subjective symptoms, as well as the objective findings, did not clearly change.

Many of the patients complained of headaches, dizziness, vertigo, and nausea after the first doses of sulfanilamide. In most of them the symptoms disappeared after two days. Two older patients had to be taken off the treatment on the second day on account of nausea and vomiting. Three other patients showed signs of cyanosis on the tenth day of treatment, and their treatment with sulfanilamide was discontinued for the rest of the two weeks' period. In one of these three patients the pulse rate went up to 140, but rapidly returned to normal after discontinuance of the drug and administration of digitalis. Three other patients showed slight signs of dermatitis medicamentosa on the forearms and legs on about the tenth day. The subjective symptom of itching and the objective dermatitis disappeared after a short interruption of the treatment. As trachoma is a disease of the more indigent part of the population, it is our impression that one has to be careful with the administration of sulfanilamide, for the general physical condition of these patients is often poor, due to bad living conditions. Medication without very close supervision is inadvisable.

After two weeks of observation and treatment we have the impression that sulfanilamide has a paling and drying effect on the succulent conjunctiva of trachoma stage 2 and milder cases of stage 3. Further, it seems to aid in the healing of pannus in cases that are not too old and not too malignant. Whether it can completely arrest the disease, and prevent recurrences, is a question for future observation.

OCULAR PEMPHIGUS*

FERDINAND L. P. KOCH, M.D.,
Rochester, Minnesota

Chronic ocular pemphigus is an uncommon disease.[1] It is usually associated with

* From The Mayo Foundation.

lesions elsewhere in the skin and mucous membranes. It may be of toxic origin, since changes of the pemphigus type are occasionally found in certain other toxic dermatoses; Welsh,[2] however, was able to demonstrate a characteristic streptococcus in the blood and nasopharynges of seven patients with clinical evidence of the disease.

The formation of blisters or bullae in the conjunctiva is followed by submucous invasion by newly formed connective tissue with subsequent cicatrization. Total ankyloblepharon and obliteration of the cul-de-sacs, together with ultimate corneal involvement, eventuate in the condition known as "essential shrinkage of the conjunctiva." The symptoms are very distressing. Secondary infection of the chronic conjunctivitis produces a mucopurulent infection, although remissions may occur. Discomfort becomes permanent as exposure and dryness supervene, and marked photophobia follows the secondary corneal involvement.

The diagnosis in the early stages depends upon recognition of the characteristic bullae, erythematous scaly patches, and early cicatrization in both the skin and mucous membranes. Tenderness of the mouth and throat often are the first manifestations of the disease for which the patient seeks relief.[3] The lesions in the conjunctiva must be differentiated from those of erythema multiforme, dermatitis herpetiformis, and from bullous syphilides.

Caro[4] has recently reported encouraging results in the treatment of dermatologic pemphigus following the administration of sulfanilamide. However, since adequate methods of treating the condition are at present unknown, the prognosis is always bad and, should the patient survive, eventual blindness will ensue.

Report of a case

A white man, an electrician, aged 54 years, of English-Irish-Canadian descent, registered at the clinic on April 25, 1938. He complained of having had difficulty with his eyes for the preceding two years, during which period he had observed a slowly progressive, painless reddening of the sclerae. Bilateral and gradual diminution of vision had existed since December, 1937. Coincident with this there had been a slow thickening of each lower lid, the lids gradually having become adherent to the lower portion of each globe. At this time an attempt had been made to improve the refractive correction but this had been unsuccessful. Local treatment had then been instituted, consisting of palliative collyrium and ointments, but this had resulted in increased smarting and burning and in occasional photophobia. Four subcutaneous injections of a substance (which was probably pituitary extract) had been administered but without effect. An occasional reddened area along the gum line below the lower front teeth had begun to appear toward the latter part of the first year. The patient described this as a "bubbling up" of the tissue. Tenderness of the mouth and cheeks and slight soreness of the throat on swallowing ingested material had manifested themselves at the end of this year. As the patient's teeth had never been in good condition he had requested that they be extracted. An upper plate, fitted about a year prior to his admission, had been worn comfortably. Four months prior to admission the lower teeth had been extracted and, as the gums had continued to remain raw and tender, a plate was not furnished. Cutaneous lesions had never been observed at any time. The patient denied having had venereal disease, and the only factor relevant to his illness was a history of duodenal ulcer.

General examination at the clinic revealed a low-grade, chronic tonsillitis, duodenal ulcer (confirmed by roentgenography), mild hypertrophy of the prostate gland, and small internal and external hemorrhoids. Examination of the mouth revealed an almost continuous, grayish-red, irregular patch along the entire upper surface of the lower alveolar ridge which continued laterally over the posteroinferior aspect of the left cheek. One small, clear, intact bulla was seen on the anterosuperior surface of the alveolar process over the site of the first right incisor tooth. Another characteristic bulla was observed in the upper portion of the right pyriform fossa. No lesions were observed over the hard or soft palate or on the lips or skin. All laboratory tests gave essentially negative results.

Ophthalmologic examination revealed the vision in the right eye to be 6/15, with correction, and in the left eye 6/20, with correction. Near vision had been reduced to the ability to read 14/35 (American Medical Association rating) with each eye, with correction. No improvement was obtained on subsequent refraction tests. The lid of each eye opened and closed normally and the margins approximated well without distortion. The palpebral fissures were equal and normal in appearance. Adequate drainage of tears was accomplished by way of the normal punctum and canaliculus of each upper lid. The skin surface of each lower lid presented a slight, brawny induration which was most marked at the margin; the cilia, however, were normally placed. The lower conjunctival fornix of each eye was approximately equally foreshortened to only a third of its normal extent. The partial obliteration by irregular thickening of each cul-de-sac had been accomplished by submucous cicatrization of both the palpebral and bulbar conjunctival surfaces. This involved the entire inferior half of each eye and extended from just above the horizontal axis temporally, sweeping across below the cornea to involve almost the entire area exposed by the palpebral fissure over the inner canthus. The erythematous and thickened palpebral and bulbar conjunctiva presented a moderately uneven surface which was studded with irregularly rounded and elongated, slightly elevated, glistening gray patches. Two small, characteristic, red bullae, typical of ocular pemphigus, were observed in the middle third of the right lower lid near the palpebral-ciliary margin. These were 2 mm. in width, 1 mm. in height, and 4 mm. in length, and they ruptured in a few hours. No bullae were ever observed in the left eye. The lower puncta had been involved in the process and, anatomically, no longer existed. Adhesions between the palpebral and bulbar surfaces already had appeared and were more manifest temporally and nasally than centrally; however, those occupying the inner canthal area of each were rather prominent (fig. 1). The external ocular movements were definitely and equally, but only moderately, limited in all the cardinal fields of action except for apparent unimpairment on horizontal and downward convergence.

The remainder of the examination gave essentially negative results. The corneas showed no manifest pathologic changes; the anterior chambers were of normal depth; the tension with the Schiötz tonometer was 11 and 13 mm. of mercury in the right and left eyes, respectively; the irides were normal in appearance and function, the pupillary reactions to the usual stimuli being satisfactorily performed, and the lenses and the vitreous bodies were clear. The ophthalmoscopic findings were essentially negative, as were also the corneal microscopic observations.

Fig. 1 (Koch). Bilateral pemphigus of conjunctiva, showing foreshortening of mucous membrane, partial obliteration of lower cul-de-sacs, and symblepharon of the internal and external canthi.

The rough fields were negative. The laboratory findings were also essentially negative, no parasites, unusual bacteria, nor an eosinophilia having been demonstrated.

Local treatment was instituted immediately following ocular examination on the day of registration. This consisted chiefly of irrigations with 2-percent boric-acid solution followed by 0.5-percent pontocaine drops. Vitamin A (10,000 units per gram) ointment in a light base was placed in both fornices of each eye. This routine was followed daily during the three weeks the patient was under observation. Epithelization of the lesions was characteristic of the moderate improvement observed. The conjunctival surfaces became somewhat smoother, the grayish patches became smaller and fewer in number, and the subjective symptoms of which the patient complained no longer manifested themselves. Distance vision improved with correction in the right eye to 6/12, and in the left eye to 6/15, and it became possible for the patient to read 14/24.5 (American Medical Association rating) with both eyes, with correction. Upon the use of a mild sodium-borate mouth-wash three times daily the lesions in the mouth followed the same general course as those in the eyes. The bulla in the right pyriform fossa was replaced by a steadily diminishing grayish patch.

The patient was not hospitalized, general treatment consisting solely of the administration of sulfanilamide to the point of tolerance. This was begun on the day of registration. Two tablets of 5 grains (0.3 gm.) each were given orally three times daily for seven days until vague nausea and continued vertex headaches appeared. After this the dosage was reduced by one half for two days, when the original dosage was resumed. The dosage was then increased to a total daily ingestion of 60 grains (3.88 gm.) and this was continued to the day of dismissal three weeks after the patient's appearance for examination. A more intensive course of treatment was not advised because of the doubtful benefit to be derived.[1, 3] The patient was dismissed for continuation of the treatment at home under the care of his family physician.

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SCLEROTOMY SCISSORS FOR ENLARGING CORNEAL INCISIONS*†

CONRAD BERENS, M.D.
New York

These scissors were constructed because of the need of a pair of strong scissors with long curved blades with which to make sections in the corneoscleral junction. The usual procedure is to make this incision with a Stevens scissors, but this has been found to be awkward.

Fig. 1 (Berens). Sclerotomy scissors for enlarging corneal incisions.

Description. These scissors (fig. 1) have spring shafts, 90 mm. in length, at one end of which are curved blades. At the other end is a screw joining the two ends of the spring. The blades, which are 11 mm. in length, are slightly curved. The upper and lower blades are blunt and the lower blade ends in a probe point.

These scissors are made in two models: one for incisions to the right and one for incisions toward the left. However, one scissors may suffice by directing the handle downward when cutting to the right and holding the handle upward when cutting to the left.

Use of the scissors. The scissors have been found particularly useful in enlarging cataract sections and for opening iridosclerectomy and iridocorneosclerectomy wounds for glaucoma when the wound has ceased to filter. The scissors are also useful in completing the circumcorneal conjunctival incision in enucleation of the eyeball and in performing other operations on the conjunctiva.

35 East Seventieth Street.

* Made by V. Mueller and Company, Chicago, Illinois.

† Aided by a grant from the Ophthalmological Foundation, Inc.

A CHART FOR TESTING VISUAL ACUITY AND ASTIGMATISM*

CONRAD BERENS, M.D.
New York
AND
S. JUDD BEACH, M.D.
Portland, Maine

This test chart is an attempt to combine the several different functions for which such charts are used. It furnishes a test of the visual acuity, adapted to young and old patients, with the different mentalities. It also furnishes a means for estimating the refraction, giving information of more than usual accuracy with regard to the amount and axis of the astigmatism.

* Aided by a grant from the Ophthalmological Foundation, Inc.

The special features that this chart (fig. 1) possesses are that (1) visual acuity may be accurately tested in children and in illiterate patients by the use of the E test, (2) for other patients and to verify the E test, the international broken ring may be used, (3) the ZN's and crosses** are useful for determining the astigmatism, and (4) usual test letters are also furnished to test both visual acuity and refraction in the conventional way.

The numbers at the side of the chart parallel with each line of figures conserve the examiner's time in designating the line to be read.

35 East Seventieth Street.
704 Congress Street.

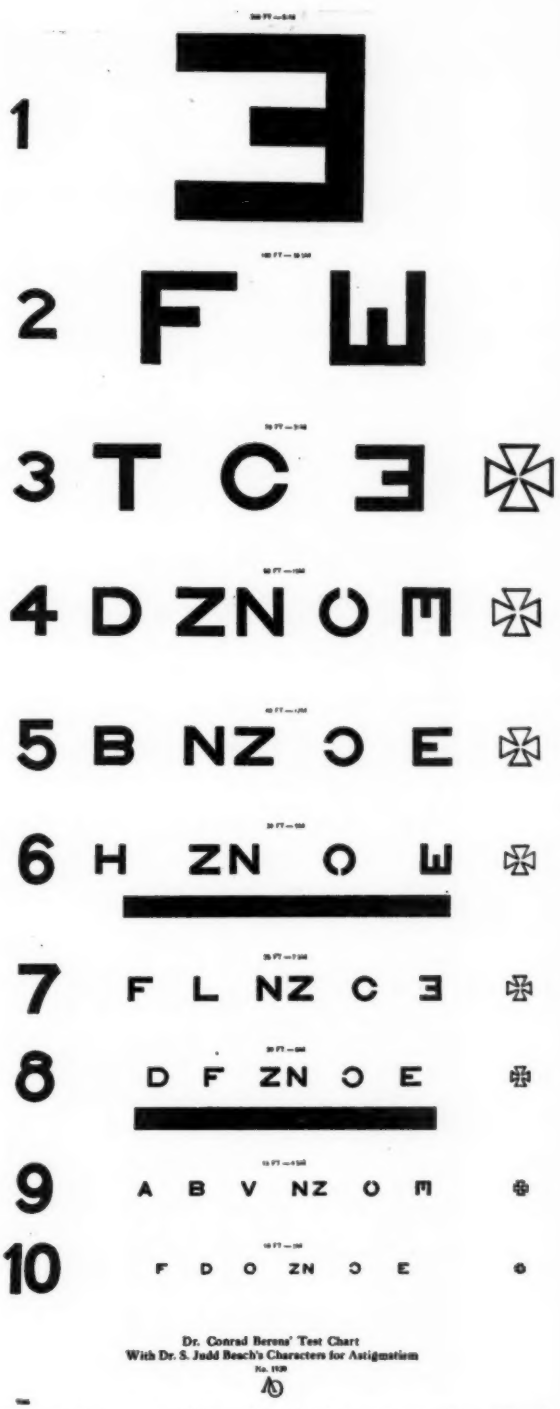
1
2 F W
3 T C
4 D ZN O
5 B NZ O E
6 H ZN O W
7 F L NZ C
8 D F ZN O E
9 A B V NZ O
10 F D O ZN O E
Dr. Conrad Berens' Test Chart
With Dr. S. Judd Beach's Characters for Astigmatism

Fig. 1 (Berens and Beach). A chart for testing visual acuity and astigmatism.

** Beach, S. J., The selection of test type for refraction Trans. Sect. Ophth., Amer. Med. Assoc., 1927.

A NEW PRISM BAR*†

CONRAD BERENS, M.D.

For several years we have been using racks of glass prisms** numbered from 1$^{\Delta}$ to 50$^{\Delta}$ for performing the screen test to measure heterophoria or heterotropia rapidly in prism diopters. They have also been used for giving prism converging, diverging, and supraverging exercises. Although these racks save much time they have a number of disadvantages. The cost is prohibitive and the prisms are easily chipped and scratched. Furthermore, the glass prism racks are heavy and cumbersome to use. Therefore, for the past few years we have experimented with various

* Aided by a grant from the Ophthalmological Foundation, Inc.

† Constructed by R. O. Gulden, Philadelphia, Pennsylvania.

** Berens, C. Present ophthalmologic standards for commercial aviation in the United States. Jour. Aviation Med., 1932, v. 3, June, p. 55.

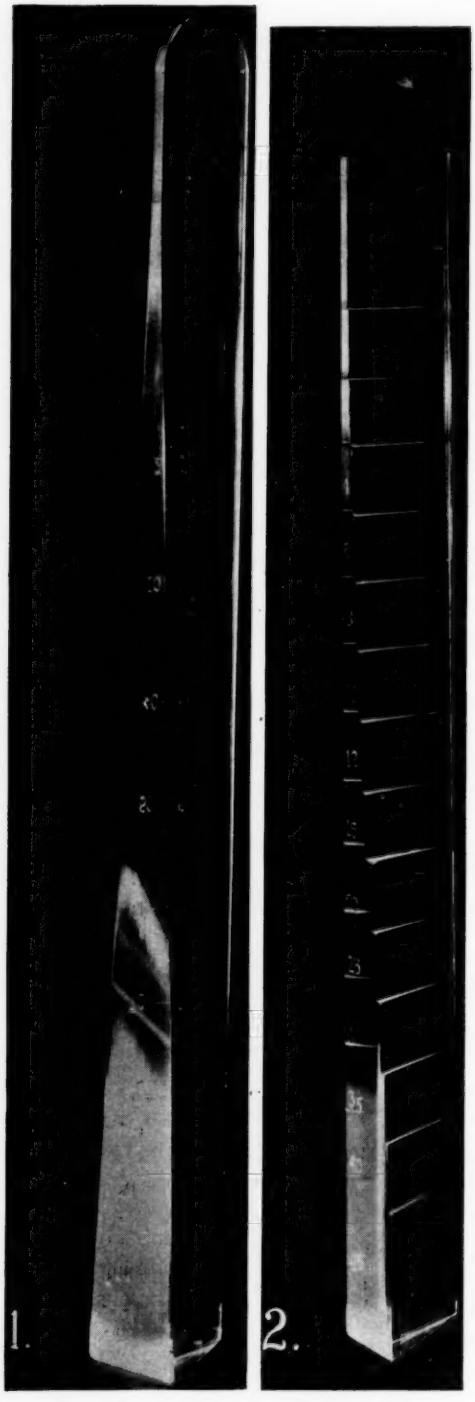

Fig. 1 (Berens). Prism rod with 100$^{\Delta}$ prism at the thick end.
Fig. 2 (Berens). A new prism bar.

substitutes for glass which have similar indices of refraction to glass and have studied the question of molded prism bars made of glass and substitutes for glass. The molds would be unnecessarily expensive and the finished products could not be guaranteed.

Prism bars, made of transparent material and filled with water and other fluids, were constructed but were not satisfactory. Finally a solid substitute for glass was ground and polished into a long rod with a 100$^{\Delta}$ prism at the thick end (fig. 1). It was a disappointment to find that the vertical prism produced by the diverging sides made the rack inaccurate and practically useless.

The prism bar illustrated in figure 2 was finally constructed. It is 12 inches in length, containing prisms from 1$^{\Delta}$ to 50$^{\Delta}$. At the ends of this bar there are ground extensions which may be used as handles and for performing the screen test.

The bar, which is made of one piece of material with an index of refraction of 1.52, is numbered in prism diopters from 1$^{\Delta}$ to 50$^{\Delta}$ on the surface made by the base of the prisms.

Advantages. The advantages claimed for this bar are: (1) it is less expensive than glass prism racks; (2) its lightness makes it much easier to handle, especially in performing the screen test when it is necessary to superimpose square prisms; (3) the material is colorless, difficult to break or chip, and apparently more transparent than glass; (4) if the surface becomes slightly scratched it may be easily repolished; (5) the material used produces a more pleasant sensation than glass or metal when in contact with the skin; (6) this prism bar does not seem to show finger marks so readily as glass and is more easily cleaned than the racks in metal frames.

35 East Seventieth Street.

SOCIETY PROCEEDINGS

Edited by Dr. H. Rommel Hildreth

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

December 21, 1937

Dr. Edwin B. Goodall, *presiding*

The production of transitory opacities of the lens in rodents

Dr. Caroline Tum Suden said that in mice, after a single intraperitoneal injection of adrenalin (0.5 mg. to 0.76 mg. per 100 gm. body weight) rapid clouding of the lens occurred in approximately one half of the test animals and disappeared within two to three hours after onset. In rats, which are twice as susceptible to the fatal effects of adrenalin as mice, formation of lens opacities with survival was rare. However, in the latter species, administration of adrenalin (0.3 mg. to 0.5 mg., per 100 gm. body weight), superimposed upon a moderate degree of histamine shock or adrenal insufficiency, produced lens opacities in 57 to 85 percent of the rats, one third of which survived with complete loss of the opacity. Similarly in mice, histamine increased the incidence of opacity formation from 50 to 90 percent and decreased the mortality rate from 15 to 7 percent.

The phenomenon was not correlated with a systemic rise in blood pressure but occurred during the period of marked hyperglycemia following the injection of adrenalin, as Collevati had previously determined in experimental animals.

Factors influencing the incidence of galactose cataract in rats

Dr. Helen S. Mitchell said that the rat has proved to be a suitable animal for use for research on cataract because in this species opacities of the lens may develop as a result of certain nutritional disturbances, while spontaneous cataract is rare. The discovery that cataract would occur in rats fed on high levels of lactose was made in the Battle Creek laboratory in 1933 and first reported to the American Society of Biological Chemists in the spring of 1934. Control experiments with other carbohydrates, starch, dextrine, maltose, sucrose, and glucose, were entirely negative. Thus galactose, a fraction of the lactose molecule, proved to be the cataract-producing agent in lactose. Dr. Yudkin as well as other workers have repeatedly confirmed these findings.

Galactose cataract resulting from the feeding of either lactose or galactose should be distinguished from vitamin-G-deficiency cataract. Both may be considered nutritional.

A variation in the susceptibility of different strains of rats to galactose cataract and a lesser but significant variation between litters are observations which have proved to be of increasing importance in the study and interpretation of accumulated data.

Studies of the sugar contents of the blood and urine of rats on cataract-producing rations have demonstrated that galactose is the sugar responsible for the high sugar contents of both blood and urine, and that it must be the major etiologic factor in this type of cataract.

One dietary factor that seems to alter the rate of development and the incidence of galactose cataract is protein. A low-protein ration (5 percent) appreciably hastens the development of opacities of the lens, and a high-protein ration tends to retard this pathologic change. Other factors, including moderate excess or deficiency of relevant vitamins, have failed to alter the cataract-producing action of galactose.

The earliest lenticular change in rapidly developing cataract is a dense vacuolated film originating at the equator and extending over a large portion of the anterior cortex of the lens, the film later disintegrating as large vacuoles and disappearing before visible opacities develop.

Regression from the stage of complete opacity to that of the nuclear stage has been observed in a large proportion of these experimental animals, but no specific dietary factor nor local medicament has seemed to alter the speed or extent of this regressive change. The age of the animal and the extent of the injury, however, do seem to influence the change.

There is no reason to believe that there is any immediate clinical application or significance in these findings, but the possibility of experimental production of opacities of the lens under carefully controlled conditions permits a new approach to a baffling subject. As a result of these studies numerous problems of a fundamental nature have arisen and warrant further investigation.

Diet and vitamins in relation to cataract

Dr. Arthur M. Yudkin said as a result of the knowledge that a cataract is an opaque condition of the lens, many attempts were made to reverse the processes by treating the eye locally and systemically. Because of the poor results following surgical treatment, many of the earlier ophthalmologists were more inclined to treat the condition with nonsurgical methods. With the advent of better surgical technique and local anesthesia, however, the ophthalmologist looked forward to removing the opaque lens by surgical means. Dr. Yudkin believes that every practicing ophthalmologist is satisfied that cataract formation is not due to a single factor but is produced by many conditions. Outstanding among these causes may be considered a disturbance of the general metabolism of the individual, with a subsequent local change in the eye. Although arteriosclerosis has never been definitely considered as a cause for cataract, it is Dr. Yudkin's belief that it must play a significant role in this respect. In view of the present knowledge of human nutrition it is advisable that all elderly patients having any signs of early changes in the lens be instructed how to live properly. Dr. Yudkin found that by taking a teaspoonful of potent yeast powder twice a day and the juice of at least two lemons daily before meals, tumescence of the lens was decreased and the tissue returned to normal, but when striae were produced by changes in the lens, no improvement was noted. The diminished vision of many of these patients was improved by this therapy, whereas a number remained the same over a period of five years. Dr. Yudkin further believes that we have a right to treat patients with a well-balanced diet supplemented by the vitamins in order to check and prevent this condition.

Atopic cataracts

Dr. William P. Beetham presented a paper briefly summarizing the relationship of cataract and dermatitis. The data on eight patients with cataracts and atopic dermatitis, hay fever, and asthma were reported, making approximately 40 such cases in the literature to date. Two types of lens changes were observed; one of the usual cataracta complicata type, and one in which a plaque of opacity in the anterior cortex was the dominant feature. A cataract of the latter type was removed intracapsularly and studied histologically. Aqueous was aspirated from two patients and injected intracutaneously with no sensitivity response. The author discussed the role of infection, avitaminosis, endocrine-gland deficiency, autonomic nervous-system disturbances, and allergy. Dr.

Beetham concluded that some unexplained allergic phenomenon was responsible. The term "atopic cataracts" was used to define and classify this association.

Virgil G. Casten,
Recorder.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

January 18, 1938

DR. EDWIN B. GOODALL, *presiding*

PRESENT STATUS OF ORTHOPTIC TRAINING

DR. EDWIN B. DUNPHY said that during the past two years he had tried orthoptic training on 29 patients with concomitant convergent strabismus. Nineteen of these (65 percent) were greatly improved in that their angle of squint was markedly reduced, so that they were able to go without glasses and maintain the visual axes approximately parallel. However, of these 19 patients, only 7 (or 24 percent of the total number) obtained a complete cure in that they had absolute binocular fixation as well as the ability to solve depth-perception charts. At the beginning of the training period all 19 had good binocular vision when slides were presented to them at their angle of squint.

Before training, these 19 cases were all of the accommodative type of strabismus in that the squint was markedly lessened by the wearing of plus lenses, so that in no case was the angle of squint more than 10 arc degrees while glasses were worn. When the glasses were removed, however, the squint increased markedly. After training, the patients were able to remove their glasses without experiencing any return of the squint, and the angle of deviation had been reduced to zero or a negligible amount. The average number of treatments for this group was 29.

Of the 10 failures only three were in cases of the accommodative type, in the other seven there was a refractive error of less than plus two diopters. In these seven the fusion sense was poor to begin with and never developed to any extent during the period of training. Cases of abnormal correspondence were not selected for training. An average of 13 treatments was given to the members of this group before the case was given up.

Dr. Dunphy said that the question will arise as to how much good orthoptic training really does. We all know of certain patients with squint who, after a period of wearing glasses, become so much better that years later glasses are discarded and there is no return of the squint.

Guibor in 1934 reported a series of 38 cases of internal squint treated by orthoptics. Fusion developed in 99 percent and correction of the squint was obtained in 50 percent. A control series of 40 cases was treated by glasses alone. In this control series fusion developed in 20 percent and complete correction developed in 7 percent. Dr. Dunphy believes this the only controlled series reported in this country, although English and French writers report more or less the same results in their controlled series.

In concluding Dr. Dunphy said that such a small series as his probably would have little value. However, it seems to him that orthoptic training is probably of value in a small group of squint patients who have normal retinal correspondence and well-developed binocular vision when tested on the synoptiscope, and whose angle of squint is not more than 10 degrees when wearing glasses.

Just how orthoptic training works he does not exactly know. It certainly does not create binocular vision when this function is absent. It may, however, improve the patient's appreciation of it so that the desire to use it is stimulated during the exercise period to such an extent that the visual axes tend more toward

parallelism in the effort to maintain it. In other words the duction power is increased.

CONCERNING ANOMALOUS PROJECTION AND OTHER VISUAL PHENOMENA ASSOCIATED WITH STRABISMUS

DR. FREDERICK H. VERHOEFF read an interesting paper on this subject.

Virgil G. Casten,
Recorder.

CHICAGO OPHTHALMOLOGICAL SOCIETY

March 21, 1938

DR. THOMAS D. ALLEN, *president*

MERCURY GLOBULE IN ANTERIOR CHAMBER

DR. WILLIAM H. DROEGEMUELLER presented a man, aged 26 years, who had suffered a corneal laceration with iris prolapse of the left eye from the glass of a broken neon sign in October, 1937. When examined, a small metallic globule was noticed in the anterior chamber, which was thought to be mercury: the presence of mercury in the neon tube was confirmed.

Operation consisted of the excision of the prolapsed iris and a sliding conjunctival flap, bridge type. The lens was not injured. An attempt was made to scoop up the globule with a small curette but because of the absence of the anterior chamber and the danger of injury to the lens this was not feasible. The postoperative course was uneventful. A roentgenogram revealed, instead of the single globule of mercury seen at the time of operation, several small particles of radio opaque material below and at the site of the laceration. There were three small metallic globules lying on the zonule of the lens.

For one month following the injury there was a mild inflammatory reaction. Cells persisted in the anterior chamber, and a few large gray-white K.P. The eye cleared, and the corrected vision was 20/20. After the second month, however, attacks of mild inflammation and corneal epithelial edema developed. This was more marked from below. A few deep vessels were noticed in the corneal stroma. The tension remained normal. The patient was treated with sodium thiosulphate intravenously, following the procedure used by dermatologists in the treatment of mercurial irritation from mercurial rubs. Under this management the condition did not progress, although the definite value of the drug may be subject to question. The present corrected vision is 20/30 but it has been as low as 20/70.

RETINITIS PROLIFERANS: A CLINICAL AND HISTOLOGIC STUDY

DR. BERTHA KLIEN discussed the pathogenesis of two different types of retinitis proliferans. The clinical and histologic characteristics of each type were described and illustrated.

Discussion. Dr. William F. Moncreiff said that the classification of retinitis proliferans into two varieties, from the standpoint of pathogenesis which Dr. Klien proposed, was of basic importance from the anatomic standpoint, and has been correlated by the essayist very strikingly and accurately with the clinical (ophthalmoscopic) findings. This concept has apparently not appeared in the literature. For those whose most immediate interest is in the therapeutic application of clinical and pathologic data, this contribution might also have some significance. While in either type the effort should be to combat the primary disease in advance of the development of retinitis proliferans, or in its earliest stages by way of prophylaxis, one might also be guided in direct therapy of the differing pathogenesis of the two forms of the retinal lesion.

In type 1 the effort should be directed toward promoting the rapid absorption of the exudates or hemorrhages by foreign protein and other intravenous therapy

and by the use of heat, employing especially the newer methods. In type 2, these methods would be expected *a priori* to be relatively ineffective, and the underlying vascular disease must be combated. In most cases the results would be disappointing except in some syphilitic cases and possibly a few diabetic cases. In the treatment of the vascular disease of hypertension, especially, sodium hyposulphate in the form of sulfactol might be found worthy of further trial.

Dr. Robert von der Heydt congratulated Dr. Klien particularly on her artistic and beautiful fundus drawings. He asked about the possible inclusion of congenital cases of massive glial proliferation. These are sometimes hemorrhagic in origin.

Dr. Bertha Klien said the first type is much more apt to lead to retinal detachment than the second, because of the large amount of connective tissue, which has a tendency to shrink with age. The second type, being more vascular, does not shrink so much, and its origin at the nerve head prevents early traction on the retina.

In answer to Dr. Goldenburg, she said that this subject had not been investigated from the hematologic point of view. Possibly alteration of the blood itself, as in polycythemia vera, which occasionally is known to cause an occlusion of the central retinal vein or its branches, might lead to vascular anastomosis and thus to the second type of retinitis proliferans.

Robert von der Heydt.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

Section on ophthalmology

March 11, 1938

Dr. Walter Camp, *president*

Headaches of ocular origin

Dr. A. D. Ruedemann of Cleveland gave a talk on this subject.

Discussion. Dr. A. D. Prangen said it is important to see that the patient has a thorough physical, and possibly a neurological, examination in a search for all the possible factors which might be causing the headaches. In cases of chronic headache of doubtful origin it seems best that some one consultant be made a sort of clearing house for all the clinical data and that he make an attempt to put the various component parts of the clinical picture together in an attempt to establish a diagnosis.

Dr. A. D. Ruedemann in answering Dr. Fink regarding children and their headaches said the child himself must be considered. He may belong to a social group in which headaches are common or he may come from more or less inferior stock. Such a child comes in contact with normal individuals and is expected by his parents to carry on as a normal child. We must remember that headache is foreign to the child as he starts out in life and someone must impart to him the idea of headache.

George E. McGeary,
Secretary.

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on ophthalmology

March, 1938

Dr. Alexander G. Fewell, *chairman*

The use of paredrine in cycloplegia

Dr. I. S. Tassman read a paper on this subject which was published in this Journal (August, 1938).

Discussion. Dr. Sidney L. Olsho said that in his office homatropine-refraction cases he has heretofore employed ten instillations at ten-minute intervals. The frequency was to make certain of a thoroughly reliable cycloplegic effect. As recommended by Beach, he had, during the past several weeks, instilled one drop in

each eye at five-minute intervals of the following: 5-percent homatropine solution, 1-percent benzedrine solution, 5-percent homatropine solution. He then waits one hour for the cycloplegic effect. To avoid having the drop squeezed out he has the patient look down, the upper lid is held up and the drop is allowed to flow over the eyeball from an insensitive point well above the cornea. Before it can be squeezed out it has mixed with the tears. The second drop of homatropine might have been omitted, but he was not making an experimental study and was employing the method for effect.

In most instances patients were able to use the eyes for close work on the following day. Postmydriatic examinations are in his opinion advisable.

The cycloplegic effect seemed to him perfectly satisfactory in the new cases. The postmydriatic reduction from the total hyperopia corresponded to that made after thorough homatropinization. In those which were reëxamination cases, the mydriatic and postmydriatic results seemed also to correspond to his expectations following the homatropine method.

Vertical-prism values in commonly used bifocals

Dr. Sidney L. Olsho said bifocal additions or "adds" are convex and spherical. The intended add is always generated in the form of a circle. In grinding standard adds the optical centers are not established in the centers of the segments but in the centers of the circles of origin. When the add becomes a bifocal-component, only a part or a segment of the circle is used.

The accepted theoretical reading point is 4 mm. below the segment's upper margin. By the Prentice rule we can find the separate vertical-prism effect of the segment at the reading point. To obtain this, multiply the diopter power of the add by the distance in centimeters of the reading point to the center of the circle of origin. The product equals in prism diopters the vertical-prism effect of the segment at the reading point.

Closely allied bifocals have been given diverse names for commercial motives and also to distinguish high grades from inferior qualities.

Certain bifocals are advertised directly to the wearer, who is obviously not qualified to select the most suitable type.

A meticulous correction of the distance vision, with careful attention to small cylinders and their axes, the certainty that all of the manifest hyperopia is corrected and that a myopia is not over-corrected effect the following advantages: they make a less high addition adequate, therefore less difference between the distance and the near corrections and hence less accommodative and adjustive change for the eyes. In any bifocal the lower the power of the add the less there is of chromatic and marginal aberration.

All modern bifocals are composite lenses. The segment is not an independent unit. The upper or main lens serves as a carrier of the segment. An infracentral, therefore, an excentric area of the main lens becomes an integral part of the composite reading portion. Accordingly the main lens introduces an inescapable prismatic effect in the reading part. If the eye be directed several millimeters below the optical center of a lens of convex power to an infracentral point, which we will call the reading point, it encounters a prism base up. At the reading point of a concave lens the prism is base down.

For practical purposes of the prescriber it will suffice to study the excentric prismatic values in prism diopters downward along the 90-degree meridian. Values so obtained are not precise for points somewhat lateral to this principal meridian.

The prism values are obtained by ap-

plication of the Prentice principle after the vertical effective powers of the lenses have been determined. Spherical lenses are vertically effective 100 percent; cylinder lenses at axis 180° are vertically effective 100 percent; cylinder lenses at axis 90° are vertically effective nil; cylinder lenses at axis 45° and 135° are vertically effective 50 percent. Compute the net vertical effective power of the cylinder and add all of the sphere for total effective power.

To obtain the vertical prism diopters, base up, for plus, or base down, for minus, unavoidably introduced by each of the distance corrections at each of the theoretical reading points (.8 cm. down from optical centers), multiply the total vertical effective power, plus or minus, of each distance correction by .8.

Dropping below the optical centers of distance corrections of unequal vertical effective powers, the eyes encounter progressively increasing vertical-prism disparity.

To ascertain the vertical-prism imbalance at the theoretical reading points, carefully compare the right and left products.

Trouble involving costs, discomfort, and reproach may be forestalled if the prescriber of bifocals will ask himself; (1) in bifocals made on this prescription will there be, within the natural reading zones, two corresponding points at which the vertical-prism imbalance will be less than one prism diopter? If so, they may be tolerated. (2) Will the vertical-prism imbalance at two natural reading points exceed two prism diopters? If so, prolonged fusion at the near point will be very difficult, if it be possible.

Standard segments of equal powers and size do not alter a disparity. Uncorrected vertical-prism imbalance may be sufficient to make bifocals unwearable. If a hyperphoria be present, a vertical-prism imbalance in the lenses establishes in the reading zone a dominance either of the appropriate or of an adverse prism effect. This must be foreseen by the refractionist.

A hyperphoria may be too little to require any help when vision is directed through the central or equatorial zones. Analysis may furthermore disclose in the infracentric reading zones of the lenses, a vertical-prism imbalance appropriate for the existent hyperphoria. In this case no vertical prism is prescribed in the upper lenses.

On the other hand, lens analysis may disclose in the reading zones a vertical-prism imbalance incompatible with the existent hyperphoria, the reading-zone prism being base up or base down on the wrong eye. In this case the burden is lightened all around by prescribing in the upper lenses for all of the hyperphoria.

Obliteration of pericorneal blood vessels for various types of keratitis—further observations

Dr. Trygve Gundersen said a carefully selected, but consecutive, series of 35 cases has been studied. These comprise a group of patients with chronic corneal disease which resisted the usual forms of treatment. The types of keratitis were grouped as follows: chronic dendritic keratitis, 6; ocular rosacea, 7; tuberculous keratitis, 12; keratitis from trauma, 2; lipin interstitial keratitis, 2; trachoma, 5; hypopyon ulcer, 1; unclassified, 1.

Obliteration of vessels was usually performed with a sharp needle attached to the diathermy unit. In a few instances, cutting instruments were used.

Some cases have been followed for almost five years. The results obtained have been classified into 4 groups: excellent, 12; good, 9; fair, 9; unimproved, 6.

W. S. Reese,
Clerk.

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Author's proofs should be corrected and returned within forty-eight hours to the *Manuscript Editor.* Twenty-five reprints of each article will be supplied to the author without charge. Additional reprints may be obtained from the printer, the George Banta Publishing Company, 450-458 Ahnaip Street, Menasha, Wisconsin, if ordered at the time proofs are returned. But reprints to contain colored plates must be ordered when the article is accepted.

NEW DRUGS FOR THE TREATMENT OF GLAUCOMA

It is generally conceded that when well-established simple glaucoma occurs in clinic patients surgery is indicated because of the impracticability of follow-up. Whether this is true in private practice or not is less clear. Certainly there are many cases in which the doctor will choose drug therapy for one reason or another, and even if surgery has been the choice, it is not infrequently necessary to supplement partial success with drugs.

Until a few years ago the only known medication was pilocarpine and eserine, and these are not always satisfactory, being sometimes too irritating and sometimes ineffective. A valuable recent addition to therapy was concentrated adrenalin, especially in the form of two-percent suprarenin bitartrate. None of these, however, is perfect; a constant lookout should therefore be maintained for other drugs.

In this issue of the Journal appears a paper on the use of two new therapeutic agents, mecholyl and prostigmine. The former is suggested for acute and congestive types of glaucoma while the latter is advocated for chronic simple glaucoma.

Mecholyl, a form of acetylcholine, is to be used either by instillation or retrobulbar injection. Like all acetylcholine products it acts as a vasodilator of capillaries, and presumably its favorable action on the eye is by elimination of waste or other abnormal products by the increased flow through the enlarged vascular bed. This is supposed to be similar to the

method of action of adrenalin after the primary constriction is over. Mecholyl must—like suprarenin—be administered cautiously; not like adrenalin because of danger both locally and systemically, but only because of the systemic reaction and possible heart stoppage. This is true especially when injected in cases of asthma or bronchial allergy, and the administrator is warned to have atropine always ready for injection should the drug act alarmingly; not exactly a pleasant thought. However, the drug is reported efficacious where other local treatment has failed and is therefore worthy of a trial.

Equally important may be the second drug described; namely, prostigmine. This, according to the author, is more potent than pilocarpine and eserine in chronic simple glaucoma in that it is effectual where these have failed. Furthermore it seems to act well in combination with mecholyl.

The need for additional armamentaria for the control of glaucoma is so urgent that these promising drugs should certainly be given a trial. But even the best drugs provide only symptomatic treatment and the study of the fundamental glaucomatous condition must be continued unremittingly because this disease of middle and late life obviously is becoming more frequent as the life span lengthens.

Lawrence T. Post.

SULFANILAMIDE FOR TRACHOMA

This drug, sometimes called prontosil album, or white prontosil, has come into prominence as a remedy to combat various diseases. Infections due to streptococcus of different varieties, pneumococcus, staphylococcus and gonococcus, are all indications for its use. Reports on its beneficial effects now occupy an important place in current medical literature. It seems to have a wide and important antibacterial action within the body. Whether trachoma is caused by bacteria, or whether it is due to a virus, may not be settled; but sulfanilamide has been used for trachoma with rather striking benefit. In our lack of knowledge of the cause and pathology of trachoma, it is worthy of trial.

At the San Francisco meeting of the Section on Ophthalmology of the American Medical Association, some of those present testified to the beneficial influence it seems to exert in trachoma. Favorable reports have been received of its use for trachoma among the Indians in different parts of this country. Since hearing of it, several ophthalmologists have tried the drug on trachoma patients and found it beneficial. Its efficacy has been especially apparent in the checking and clearing up of corneal lesions.

In the Lancet for October 29th, Dr. Kirk, of Khartoum, Africa, and two colleagues give their experience with sulfanilamide in 25 cases of trachoma among the natives of Central Africa. In all the cases but one there was improvement of the eye conditions. In three cases with less than one month of previous treatment there was rapid improvement in two and slower improvement in the third. Among eight cases that had previously been under treatment "for months," six showed rapid improvement, one slow improvement, and one improved at first and then suffered a relapse. Four cases that gave history of previous treatment for years, and eight that gave no history of previous treatment, all improved under sulfanilamide. Where trachoma was complicated with vernal conjunctivitis (spring catarrh), the results were not so good.

The drug was given in tablets, one-half gram each, three times a day for seven days; and then an intermission of seven

days. In one case there was no intermission, and it improved rapidly. Sulfanilamide, like other new drugs of known power, must be used with caution. Great value in combating the disease for which it is used may be offset by danger of very undesirable or even fatal effects. This has been illustrated by the danger of dinitrophenol causing cataract. Intermissions in treatment have been used to guard against possible dangers of sulfanilamide. It belongs to a class of drugs that sometimes damage the blood-making organs, and cause death by leucopenia (agranulocytosis). This is sometimes, perhaps, caused by the original disease, but sometimes probably from the effect of the drug. If used long, blood counts should be made from time to time; and if the leucocytes fall below the normal number, the drug must be stopped.

It now seems we may have in sulfanilamide a drug that may cure a disease that has been known for thousands of years as a most important cause of blindness. It should be tried, with proper precautions, in every case of trachoma that is surely recognized and that may be properly watched and controlled. Can it cure? Is the cure permanent? How is the drug best used? What must be done to guard against its dangers? A large number of eye physicians and general practitioners may be properly expected to seek the answers for these questions.

Edward Jackson.

HYPERTENSIVE RETINITIS

Much of the language of ophthalmology dates back to remote antiquity. The name "cataract" was given to something which was assumed to fall across the sight. "Glaucoma" was the term applied to a condition of blindness associated with a green (or blue-gray) shimmer in the pupil. These and other expressions were of Greek origin, because Greek physicians had laid the foundation for medical knowledge as it was still accepted and applied through the period of the Roman Empire and the centuries of the Renaissance, with its revival of classic learning and its dim groping for new scientific facts.

Our study of the ocular background in the living subject is about three fourths of a century old. Its terminology is partly antiquated and is often confusing. The term "retinitis," implying an inflammation of the retina, is attached to a number of conditions in which the retina is certainly not "inflamed," and in which the changes are of a degenerative character. To the presence of an excess of circulatory fluid in the nerve-head we often apply the peculiarly idiomatic title of "choked disc," and those who prefer a more international terminology substitute for this the term "papilledema," whose Greek origin would seem to imply a watery swelling of a protruding structure, whereas the normal optic disc represents rather a depression than a protrusion as related to the general fundus level.

The exact significance of retinal changes is often veiled in mystery. Particularly is this true as regards the relationship between retinal vascular changes and disturbances of the general vascular system. What essential distinctions are there between diabetic disturbances of the retina and those encountered in association with nephritis? How far can we interpret the grave systemic implications of general vascular hypertension, or of renal degeneration, on the basis of our ophthalmoscopic findings?

It is interesting to recall the origin of the expression "albuminuric retinitis," still more or less generally used for a group of changes of which the most striking feature is a star-shaped pattern in the macular region. Before the invention of

the ophthalmoscope, it had been common knowledge that loss of vision often occurred in association with dropsy. When the local basis for such loss of vision was found in the retina, the "retinitis" was called "albuminuric" because albuminuria was one of the prevailing symptoms of nephritis. We now know that albuminuria has no direct relationship to the retinal changes, and that indeed the latter may exist without the former.

Bright, with whose name the subject of nephritic disease has been so closely associated, assumed a cerebral location for the visual disturbances. Other writers attributed the retinal hemorrhages and other changes to increased pressure from cardiac hypertrophy. But the "retinitis" may occur in the absence of any such cardiac change.

The circulatory theory explained the retinal degeneration as depending upon the vascular changes which are so striking in the microscopic anatomy of severe cases, especially in the form of hyalin degeneration of the walls of the small arteries and the capillaries. Unfortunately for this theory, vascular changes may be entirely lacking in severe recent cases of "albuminuric retinitis."

The mechanical theory held a persistent angiospastic ischemia of the retinal vessels responsible for the conditions found with the ophthalmoscope; explaining the tissue changes as due to disturbance of nutrition by reason of deficient blood supply. Wagener and Keith have attached great importance to hypertension associated with arteriolar sclerosis.

In a monograph on this subject presented by request to the Société d'Ophtalmologie de Paris as its annual "report" (Bulletin de la Société d'Ophtalmologie de Paris, 1938, November; 200 pages including bibliography of 19 pages) Dubois-Poulsen takes exception to the title—"hypertensive retinitis"—under which the subject was referred to him. He points out that in the phenomena under consideration there are neither infectious nor inflammatory lesions. The noun "retinitis" and the adjective "hypertensive" are not, he says, adapted to the sense in which they are used. He agrees with Fishberg and Gresser, who would adopt the term "hypertensive neuroretinopathy." (See Fishberg: "Nephritis and hypertension," Philadelphia, Lea and Febiger; and Gresser, American Journal of Ophthalmology, 1935, volume 18, page 426.)

Dubois-Poulsen suggests that greater importance should be given than previously, in the ophthalmoscopic picture of the retinopathies, to papilledema and the sphygmoscopic signs. He insists that there is nothing specific in the character of hypertensive retinopathology, but that it is merely a specialized reaction of the retinal tissue to the underlying systemic pathology. Arterial hypertension is the most frequent factor, manifesting itself in various clinical forms. Renal insufficiency is a factor almost equally important but less frequent, and the renal lesions are of a vascular type. However, arteriosclerosis, spasm, arteriolosclerosis, and local arterial hypertension may all alike exist without any retinopathic manifestation.

Who can say whether the renal lesions are secondary to the arterial hypertension, or the latter to the former? This has been one of the most debated problems in general pathology, and is not yet entirely settled. In the development of retinopathy nephritis may precede or may follow hypertension. But retinopathy may appear in the course of arterial hypertension without discoverable renal lesions, either functional or anatomic. Thus it seems logical to admit that the hypertension dominates the pathogenesis and that the renal factor is of less importance.

Direct proof for either side of the argument is lacking.

The old notion of arteriosclerosis as the underlying vascular factor has been replaced by the newer conception of arteriolar sclerosis. Thus an increased importance is attached to ophthalmoscopic examination of the smaller branches of the retinal arteries, and we are reminded once more that the background of the eye is the only place in the human body where blood vessels of arteriolar caliber may be studied in the living subject. Dubois-Poulsen lays stress upon the fact that the great majority of cases of "retinopathy" are accompanied by hypertension of the cerebrospinal fluid. This hypertension may be so severe as to create a special form simulating cerebral tumor by the presence of such functional signs as headache and vomiting, especially when complicated by papilledema.

The therapeutic possibilities in such cases are not encouraging. Dubois-Poulsen mentions, as offering the greatest prospect of symptomatic improvement, cerebrospinal decompression. Its results are often very incomplete and very inconstant. The procedure is dangerous if the decompression is excessive, and if inadequate attention is paid to the following contraindications: cardiac insufficiency, greatly elevated general arterial pressure, and very violent headaches. If the general blood pressure does not fall after puncture, decompression is useless. It is suggested that trial should be made of adrenalectomy and splanchnotomy. Some encouraging results have followed irradiation of the adrenal region.

W. H. Crisp.

BOOK NOTICE

DOCUMENTA OPHTHALMOLOGICA. Edited by A. Juhász-Schäffer. Volume 1. Paperbound, 482 pages. Masson et Cie, Paris, 1938.

The Documenta Press which has been publishing the Documenta Gynaecologica, Documenta Oto-Rhino-Laryngologica, Documenta Dermatologica, Documenta Neurologica, and so on, has now entered the ocular field with the Documenta Ophthalmologica.

The purpose of these Documenta is to present monographs on ocular subjects by outstanding workers in their particular fields. They attempt to condense the extant knowledge to date on the subject and to give their own opinions. Published as an international project with editors in many countries, the first volume contains a variety of material, extremely well handled by eminent ophthalmologists. The list is so excellent that it is worth the space to give it in full: R. Granit, Helsingfors: Processes of adaptation in the vertebrate retina in the light of recent photochemical and electrophysiological research. F. P. Fischer, Utrecht: Der Wasserhaushalt des Auges und seiner Teile. P. Bailliart, Paris: La circulation rétinienne. P. Karrer, Zürich: Die Bedeutung der Carotinoide für die Augen. A. Juhász-Schäffer, Milano: Le Vitamine nei loro rapporti con l'oftalmologia. A. Magitot, Paris: Symtomatologie du Glaucome et le problème pathogénique. J. Nordmann et Reiss, Strasbourg: Le problème physico-chimique de l'opacification du cristallin.

No attempt will be made to epitomize these articles, which are already condensations from a vast literature, one of them having 29 pages of bibliography. How successful the publication will prove in the United States is difficult to estimate because of the inability of the great majority of our ophthalomogists to read foreign languages. Only one of the seven articles is written in English. It is a pity that all of them cannot be translated into English because they are too good to be missed. The journal is worthwhile, and if

the successors to the first volume are as good as it is, there should be a definite place for this publication in the ophthalmological field.

Lawrence T. Post.

CORRESPONDENCE

TRACHOMA BODIES FROM THE NORMAL CONJUNCTIVA

1528 Crescent Street,
Montreal, Canada,
February 1, 1939

Editor, American Journal of Ophthalmology.

Sir:

In the Ophthalmic Record of June, 1910, the undersigned in a short article reported the finding of trachoma bodies in the normal conjunctiva. At that time, in a general search for trachoma bodies in all sorts of tissue, a number of babies at the Maternity Hospital were examined, and in two of the apparently normal cases, numerous inclusion bodies were found.

Following the War period, resumption of this work was again undertaken, and since that time have been seen a number of cases with inclusions which would have entirely escaped observation because of the mildness of the clinical signs, except that we had been constantly on the lookout for inclusion cases. This occurred not only in infants but in adults as well.

In the light of these cases, it has been my belief for some time that those previously reported as normal were mild inclusion conjunctivitides. Topley and Wilson in their latest edition state "whatever the structure of inclusion bodies may be, their presence in tissue is a sure sign of infection." With that statement I am in accord in that I now believe that the presence of inclusion bodies in the conjunctival cells, either free or within the cells, is indicative of a pathological condition.

(Signed) S. Hanford McKee, M.D.

ERRATUM

In the abstract of the Auffinger paper on page 102 of the January issue, the word "amber" was by editorial mistake substituted for "meerschaum," the correct translation.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Wheeler, J. M. **Implantation of hollow grooved body into orbit for filling; late after enucleation of eyeball.** Arch. of Ophth., 1938, v. 20, Nov., pp. 709-712.

Correction of the appearance of sinking of an artificial eye is best accomplished by an implantation into the muscle cone behind the fundus of the socket. For this a special hollow glass body, in which four grooves have been made for reception of the recti muscles, is implanted behind Tenon's capsule. A horizontal incision is made in the conjunctiva completely across the fundus of the socket and then the conjunctiva completely dissected from Tenon's capsule, then a vertical incision is made through Tenon's capsule deep into the orbital tissues and the grooved body inserted. Mattress sutures are placed in Tenon's capsule so as to cause overlapping of the flaps and the conjunctiva is closed with interrupted sutures. A firm pressure dressing should be applied for about one week. A prothesis may be fitted three weeks after operation. (Discussion.) J. Hewitt Judd.

4

OCULAR MOVEMENTS

Bielschowsky, A. **Lectures on motor anomalies. 4. The etiology of strabismus.** Amer. Jour. Ophth., 1938, v. 21, Dec., pp. 1329-1342.

Bielschowsky, A. **Lectures on motor anomalies. 5. Development and course of strabismus.** Amer. Jour. Ophth., 1939, v. 22, Jan., pp. 38-43.

Grove, R. C. **Unusual combination of ocular paralyses following radical operation on antrum.** Arch. of Otolaryng., 1938, v. 27, March, p. 275.

Grove presents a case in a white male aged 52 years, in whom a radical Caldwell-Luc operation was done on an antrum. Immediately following this, and still present after 2½ years, was a paralysis of the abducens and of the long branch of the inferior division of the oculomotor. This was due to trauma

by instrumentation through a defect in the floor of the orbit.

Theodore M. Shapira.

Miklos, Andor. **Does an escape squint occur after squint operations?** Graefe's Arch., 1938, v. 139, pt. 3, pp. 532-540.

In the author's experience, based upon 300 cases, an escape squint as claimed by Van der Hoeve never occurs after operation for strabismus.

H. D. Lamb.

Vorisek, E. A. **The treatment of concomitant convergent strabismus.** Amer. Jour. Ophth., 1938, v. 21, Dec., pp. 1356-1360.

5

CONJUNCTIVA

Agnello, Francesco. **Papilloma of the caruncle.** Rassegna Ital. d'Ottal., 1938, v. 7, July-Aug., pp. 553-559.

The writer gives a good description of the anatomy of the lacrimal caruncle and discusses the various tumors which arise from this structure. He cites the case of a 62-year-old man with a papilloma of the left caruncle. From the histologic findings he classifies the growth as a papilloma with cutaneous epithelium. Up to 1928 only 189 tumors of the caruncle had been reported. (2 figures.)

Eugene M. Blake.

Mathis, Giovanni. **Ocular lesions in myxomatosis of rabbits.** Rassegna Ital. d'Ottal., 1938, v. 7, July-Aug., pp. 543-552.

Myxoma is a particular affection of rabbits and presents a characteristic and nearly constant pathologic picture, ending in death within a few days. The author studied a series of cases in rabbits and concludes from clinical and histologic examinations that the myxomatous virus induces severe acute catarrhal conjunctivitis with striking macroscopic and microscopic alterations of the connective tissue of the lids. The changes are similar to those occurring in the subcutaneous tissues of other parts of the body, especially about the natural orifices. (4 figures.)

Eugene M. Blake.

Muscatello, Francesco. **A peculiar histologic aspect of bilateral conjunctival hyperplasty in trachoma.** Boll. d'Ocul., 1938, v. 17, March, pp. 195-210.

The writer describes the histomorphology and histochemistry of a hyperplastic granulomatous conjunctiva which had been affected by trachoma. The patient was a woman 41 years of age. (Bibliography, 9 figures.)

Melchiore Lombardo.

Poleff, L., and Nain, M. **The Weill-Félix reaction in trachoma and its theoretical and clinical value.** Revue Internat. du Trachome, 1938, v. 15, July, p. 113. (See Amer. Jour. Ophth., 1939, v. 22, Feb., p. 217.)

Sobhy Bey. **A propos "The pyrexias and trachoma."** Rev. Internat. du Trachome, 1938, v. 15, July, p. 126.

Monocular trachoma was cured by an attack of measles. This case is cited to show the basis for the author's success with milk injections in trachoma.

J. Wesley McKinney.

Thygeson, P., and Richards, P. **Nature of the filtrable agent of trachoma.** Arch. of Ophth., 1938, v. 20, Oct. pp. 569-584; also Trans. Sec. on Ophth., Amer. Med. Assoc., 1938, 89th mtg.)

The virus of trachoma, with the

viruses of inclusion blennorrhea and psittacosis, appear to form a group transitional between the rickettsiae and the typical viruses. The results in 22 filtration experiments are summarized to show that the etiologic agent is filtrable under certain conditions. The facts presented by a summary of 320 cases in ten series indicate that this agent has the characteristics of a virus (filtrability, inclusion-body formation, and noncultivability on nonliving mediums), and that it is identical with the elementary body of Halberstädter and Prowazek. J. Hewitt Judd.

Torres Estrada, A. **Some rules of conduct for treatment of pterygium.** Anales de la Soc. Mexicana de Oft., 1937, v. 11, Jan.-March, pp. 187-204.

Several operative procedures are well illustrated. The author considers it very important in each case to know whether the pterygium has invaded Bowman's membrane. He outlines and illustrates the technique used by himself, the steps of which are briefly as follows: transfixion with a cataract knife, the back of which is then used to separate the head of the pterygium thoroughly from the cornea; resection of the head of the pterygium; removal of the episcleral tissue underlying the body of the pterygium; an incision upward from the upper edge of the pterygium near the semilunar fold, and a second incision downward from the lower edge of the pterygium near the limbus, the flap formed by the upper incision being carried into the gap left by the lower incision so as to form a sutured "N" perpendicular to the palpebral aperture. (The description of this procedure is not entirely clear.) The author regards this technique as less likely than the McReynolds to be followed by recurrence. W. H. Crisp.

6

CORNEA AND SCLERA

Bessey, O. A., and Wolbach, S. B. **Vascularization of the cornea of the rat in riboflavin deficiency with a note on corneal vascularization in vitamin-A deficiency.** Jour. Exper. Med., 1939, v. 69, Jan. 1, p. 1.

The authors kept albino rats on riboflavin-deficient diets and studied vascularization of the cornea by microscopic, injection, and slitlamp methods. The rats ceased to grow after three weeks, and by the end of the fourth week a marked radial ingrowth of capillaries into the cornea from the limbus vessels could be seen by slitlamp. Later corneal turbidity due to leucocytic infiltration developed. After supplying the deficient riboflavin to the diet, the corneal turbidity usually cleared within 48 hours, and after two weeks the blood vessels could no longer be seen by slitlamp. In reviewing studies on the vascularization of the cornea in vitamin-A deficiency, great similarity between this and the vascularization in riboflavin deficiency was found. The rôle of riboflavin as a respiratory carrier and the altered physiology following keratinizing metaplasia in vitamin-A deficiency suggested that the vascularization in each case might be in response to asphyxia of the corneal stroma. (Illustrations.) George A. Filmer.

Gundersen, Trygve. **Results of autotransplantation of cornea into anterior chamber; their significance regarding corneal nutrition.** Arch. of Ophth., 1938, v. 20, Oct., pp. 645-650.

The finding of the scleral disc in the anterior chamber of a patient on whom a trephining operation had been performed eight years previously suggested these experiments in which the

viability of all corneal layers in the aqueous humor was studied by introducing full thicknesses of cornea into the anterior chamber in seventeen cats and ten rabbits. A disc of cornea was removed from one eye with a mechanical trephine and immediately introduced into the anterior chamber of the opposite eye through a small keratome incision. It was found that the corneal epithelium could not subsist when nourished by the aqueous alone, as it disappeared entirely from each implant. The other corneal tissues can live almost unaltered in aqueous for a period up to the duration of these experiments, twenty months. The endothelium not only lives but proliferates. (Photomicrographs.) J. Hewitt Judd.

Kentgens, S. G. **Vitamin-A therapy in corneal lesions.** Ophthalmologica (formerly Zeit. f. Augenh.), 1938, v. 95, Oct., p. 1.

The author believes that systemic and local use of vitamin A is useful in herpes, keratitis punctata, marginal ulcers, and catarrhal ulcers. In 48 patients afflicted with one of these lesions and treated with vitamin A, the average healing time was seven days, while 38 patients with similar lesions from whom vitamin-A preparations were withheld had an average healing time of eighteen days. In systemic therapy he uses standardized cod-liver oil; locally, this same preparation as eye drops or made into an ointment.

F. Herbert Haessler.

Kraupa, Ernst. **Punctate and annular corneal degeneration.** Ophthalmologica (formerly Zeit. f. Augenh.), 1938, v. 96, Oct., p. 34.

In each of two patients, aged 50 and 69 years respectively, a white corneal opacity was observed less than 0.25 mm. in diameter. Slitlamp observation showed the defect to consist of finest bluish-white punctate opacities in several of the more superficial strata of the substantia propria. The entire opacity was surrounded by a ring just under Bowman's membrane, beyond which were a few scattered puncta. There was no corneal vascularization. The manifestations did not change with treatment and diet as do the corneal opacities associated with synchysis scintillans. The annular part of the opacity is unique. It is entirely different from the inflammatory halo surrounding foreign bodies, ulcers, herpes, hemosiderin, the annular rents of Bowman's membrane in keratoconus after blunt trauma, the Kayser-Fleischer ring, or outer or inner embryotoxon or gerontoxon. The ring in question is not sharply delimited and is not closed. The significance of the case is not clear.

F. Herbert Haessler.

Roy, J. N. **Tattooing of the cornea.** Ann. d'Ocul., 1938, v. 175, Nov., pp. 836-841.

Report of a case of successful India-ink tattooing of a corneal leucoma in several stages. John M. McLean.

Salzmann, Maximilian. **Glaucomatous degeneration of the cornea.** Graefe's Arch., 1938, v. 139, pt. 3, pp. 413-464. (See Section 8, Glaucoma and ocular tension.)

Seech, S. G., and Cooper, W. L. **Experimental iontophoresis of rabbits' corneas. Report of two cases of corneal dystrophy with treatment by ionic medication.** Arch. of Ophth., 1938, v. 20, Oct., pp. 624-640.

The literature is reviewed and the results of animal experimentations for the purpose of investigating the efficacy

of zinc sulphate, zinc chloride, barium chloride, sodium chloride, colloidal sulphur, and quinine bisulphate are reported. A definite sequence of tissue changes in the rabbit corneas was found. These changes are divided into reparative or therapeutic, borderline changes, and pathologic or destructive changes. The authors believe that the reparative or therapeutic changes produced by this method of treatment are definitely beneficial, and they report two cases with corneal dystrophy in which the treatment was successful. The tissue changes are shown by photomicrographs. J. Hewitt Judd.

Swindle, P. F. **Events of vascularization and devascularization seen in corneas.** Arch. of Ophth., 1938, v 20, Dec., pp. 974-995.

The metamorphosis of the arteriovenous anastomoses in the cornea of the Rocky-Mountain bighorn lamb, which is the only animal in which the apparently normal cornea becomes extensively invaded by blood vessels, is not completed until the lumen of the principal arterial trunk becomes spontaneously obliterated. The bouquets of vascular loops vanish rapidly after the lumens of the principal arterial trunks become obliterated. By means of rhythmic injection of India ink or red mercuric sulphide the vascularization of the corneae of various normal and ailing animals has been studied and the results are reported here. An inflamed cornea may become almost completely vascularized by preëxisting scleral and conjunctival vessels before a new blood vessel develops in it. In fact, many vessels may become destroyed in the process. This is vascularization unaccompanied by neovasculogenesis. The development of loops and incomplete loops or diverticula and the spontaneous destruction of corneal vessels are described. (Photomicrographs.)

J. Hewitt Judd.

Trematore, M. **Parenchymatous keratitis in acquired syphilis.** Rassegna Ital. d'Ottal., 1938, v. 7, July-Aug., pp. 520-534.

Trematore reports a case of interstitial keratitis occurring less than two months after an initial genital sore in a sixteen-year-old boy in whom no signs of hereditary lues could be found. There was no evidence of the disease in the parents or any of the other six children. Wassermann reactions were negative and remained so even after provocative injections. After five months of treatment, the cornea of one eye cleared, leaving no trace of cicatrization or vascularization. The author reviews the literature pertaining to the subject. He cites the rather widely divergent findings as to frequency of interstitial keratitis in acquired syphilis, and discusses the questions of reinfection and superinfection in syphilis.

Eugene M. Blake.

Verhoeff, F. H., and King, M. J. **Scleromalacia perforans.** Arch. of Ophth., 1938, v. 20, Dec., pp. 1013-1035. Also Trans. Sec. on Ophth., Amer. Med. Assoc., 1938, 89th mtg.

Fourteen cases of scleromalacia perforans described in the literature are reviewed and a new typical case is reported. It is the first in which an eye affected with this disease has been obtained for microscopic examination. The patient was afflicted with rheumatoid arthritis. The primary ocular lesion consists of a sharply defined area of necrotic scleral tissue, which becomes surrounded by a wall of endothelioid cells and is slowly infiltrated with pus cells. This produces a seques-

trum which becomes completely disintegrated and densely infiltrated with necrotic pus cells. The abscesses perforate the sclera and discharge their contents externally, producing the characteristic cavities. Histologically, in their initial stages the scleral nodules are essentially similar to the subcutaneous nodules of rheumatoid arthritis. To avoid intraocular complications from the toxins, curettage of the scleral nodules is suggested. (Photograph, color plate, photomicrographs, discussion.) J. Hewitt Judd.

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Ascher, K. **Epithelial downgrowth into anterior chamber; regressive changes and healing after roentgen therapy.** Ophthalmologica (formerly Zeit. f. Augenh.), 1938, v. 96, Oct., p. 29.

Downgrowth of epithelium into the anterior chamber probably occurs from delayed closure of the wound. It is unlikely that implantation of epithelium into the anterior chamber during operation is a factor. Thermocautery, radium, and roentgen rays have been used therapeutically, not always with success.

In one patient, the author applied roentgen therapy—a total of 1800 r. in five doses at intervals of four to seven days. After the second treatment, the membrane became thinner and gradually disintegrated. The eyeball became and remained normal, with a vision of 6/6. F. Herbert Haessler.

Bencini, Alberto. **Congenital familial diffuse atrophy of the choroid.** Boll. d'Ocul., 1938, v. 17, April, pp. 217-254.

Two brothers aged 35 and 38 years respectively complained of progressive diminution of visual power and of hemeralopia. Both were myopic. The fundus examination showed pinkish discs with blurred margins and contracted arteries, a circumpapillary zone of choroidal atrophy diffusely pigmented, and around this a sector of atrophic choroid. At the periphery the fundus had a blackish-red aspect. The pigment, diffusely distributed throughout the fundus, was irregularly massed in some places and absent in others, but nowhere had an osteoblastic form. The visual fields were markedly contracted, and the light sense markedly lowered. The family history is given, and shows only the males affected. In spite of possessing some characteristics in common with pigmentary degeneration of the retina, the present case differed from that entity in the absence of a diencephalic symptomatology, in the possession of normal renal function, and in other ways. (Bibliography, 9 figures, 2 tables, 4 colored pictures.)

Melchiore Lombardo.

Berens, C., Angevine, D. M., Guy, L., and Rothbard, S. **Eye lesions in experimental infections, special reference to arthritis.** Amer. Jour. Ophth., 1938, v. 21, Dec., pp. 1315-1327.

Friedenwald, J. S., and Stiehler, R. D. **Circulation of the aqueous. 7. A mechanism of secretion of the intraocular fluid.** Arch. of Ophth., 1938, v. 20, Nov., pp. 761-786.

To facilitate continuity of the argument and to avoid confusion, this report on the character and mechanism of the irreciprocal permeability of the ciliary body presents the details of the experimental technique and protocols in small type and the text in large type, but the two portions are so arranged that they may be read continuously. The experiments include investigations of the permeability of the ciliary body to various

acid and basic dyes, the oxidation-reduction potentials of the ciliary body, the enzyme systems of the stroma and epithelium, the stroma-epithelium barrier, the transfer of water and the other components of the blood-aqueous barrier, the capillary wall, and the epithelial-cell membrane. It was discovered that the ciliary body showed an irreciprocal permeability to certain dye stuffs as well as to water, and the behavior of the dyes indicated that an electrical phenomenon was involved. Water and basic dyes are transferred from the stroma to the epithelium, that is, from the blood to the aqueous, and the acid dyes in the reverse direction. An electrical current which transfers the water and cations from the stroma to the epithelium and the anions from the epithelium to the stroma is supplied by the differences between the oxidative and the reductive processes in epithelium and stroma. The electric circuit is completed by an electron transfer through the stroma-epithelium barrier, presumably through the reversible oxidation-reduction system of the barrier. An appendix to the paper contains information regarding identification of the dyes, association or polymerization, and the ionic charge and relative mobility of the dyes.

J. Hewitt Judd.

Robertson, J. D. **Some observations on fluid interchange and its bearing on certain ophthalmological problems.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 75.

Combined study of fluid interchange and intraocular pressure confirms the opinion held by the author for the last few years that the aqueous humor cannot be regarded as a dialysate. The response of intraocular pressure to intravenous injection of solutions of various concentrations cannot be explained by the simple laws which govern a dialysate. This, combined with other evidence, points to formation of the aqueous humor by the mechanism of secretion.

Beulah Cushman.

Samuels, Bernard. **Panophthalmitis and sympathetic ophthalmia.** Arch. of Ophth., 1938, v. 20, Nov., pp. 804-811; also Trans. Amer. Ophth. Soc., 1938, v. 36.

This discussion includes an explanation of varying amounts of uvea remaining in phthisic globes following closed and open panophthalmitis, the incidence of panophthalmitis in sympathetic ophthalmia, the diagnosis of sympathetic tissue in panophthalmitis, the clinical importance of diagnosis of sympathetic ophthalmitis from the microscopic picture, the ordinary lymphocytic infiltration and sympathetic lymphocytic infiltration in the choroid, and the bearing that the facts presented may have on experimental work in sympathetic ophthalmia.

J. Hewitt Judd.

Valle, Sergio. **Concerning Hoffmann's "early leprous choroiditis."** Arquivos Brasileiros de Oft., 1938, v. 1, Aug., pp. 31-51.

The author confirms the opinions expressed by Adjemian about forty years ago, namely that the diagnosis of this condition has not been firmly established, and that for its proof all other causes must be excluded.

W. H. Crisp.

Waldmann, Béla. **Parallel study of the pathogenesis of rhinogenous optic neuritis and of serous iritis.** Amer. Jour. Ophth., 1939, v. 22, Jan., pp. 44-53.

8

GLAUCOMA AND OCULAR TENSION

Bellows, J., Puntenney, I., and Cowen, J. **Use of sorbitol in glaucoma.** Arch. of Ophth., 1938, v. 20, Dec., pp. 1036-1043.

Laboratory experiments on dogs showed that sorbitol was slightly diffusible into the anterior chamber, and the drug was found to be an effective agent in reducing abnormally high intraocular tension when injected intravenously into human beings. The results in twelve cases are tabulated. Because of its slight diffusibility, a secondary rise in tension above the initial value was not observed. It is suggested that 100 c.c. of a 50-percent solution of sorbitol be administered intravenously and repeated in 24 hours if necessary. It is especially useful in those cases not responding to miotics and as a preparation for operation. J. Hewitt Judd.

Bhaduri, B. N., and Biswas, C. K. **Effect of dark adaptation on the tension of eyes in patients suffering from epidemic dropsy.** Calcutta Med. Jour., 1938, v. 34, Sept., p. 206. (See Amer. Jour. Ophth., 1938, v. 21, May, p. 571.)

Bhaduri, B. N. **Enormous reduction of intraocular tension in the unoperated eye following sclerocorneal trephining in the other eye in a case of epidemic dropsy.** Calcutta Med. Jour., 1938, v. 34, Dec., p. 532.

A case report of a sixteen-year-old girl with high intraocular tension and vision reduced to light perception in both eyes. Following Elliot trephining of one eye, the tension in the unoperated eye dropped to 37 mm. Hg (Schiötz) and vision shortly returned to normal. Tension in the unoperated eye remained somewhat elevated and the visual field became further contracted, so trephining was later necessary on this eye also.

George A. Filmer.

Ernsting, H. C. **Intraocular tension in electropyrexia.** Amer. Jour. Ophth., 1939, v. 22, Jan., pp. 54-56.

Holmes, W. J. **Congenital buphthalmos complicated by dislocation of lens and hemorrhage into vitreous, with complete recovery of central vision.** Arch. of Ophth., 1938, v. 20, Nov., pp. 757-760.

A man aged 31 years was struck by a finger in his only eye, which was buphthalmic, and on which a Lagrange operation had been performed fifteen years previously. A massive hemorrhage into the anterior chamber and vitreous obscured for a time the fact that the lens was dislocated backward. Later the lens appeared as a freely swinging white mass back of the ciliary region. The author feels that the remarkable final vision, the maintenance of normal intraocular tension, and the absence of any further constriction of the field over a period of a year after the injury are due largely to the fact that the drainage operation had been done early and properly.

J. Hewitt Judd.

Salzmann, Maximilian. **Glaucomatous degeneration of the cornea.** Graefe's Arch., 1938, v. 139, pt. 3, pp. 413-464.

Degenerative changes in the cornea occurring in glaucoma may be divided into those of the epithelium, those of the superficial nerves, and pannus extending from the limbus. These are described and illustrated under epithelial opacities, shrinking, swelling, necrosis of the epithelial cells, the for-

mation of superficial vacuoles and hollow spaces in the epithelium, hydropic degeneration of the cells, and the formation of fluid between the epithelial cells. Changes of the superficial nerves include dilatation of the nerve canals in Bowman's membrane, proliferation of the cells of the nerve-fiber sheath, groups of cell nuclei in phlyctenule-like formations in the break in Bowman's membrane, and formation, over the breaks, of islands of avascular connective tissue. The author thinks the entire process could be designated superficial neurodystrophy of the cornea. Glaucomatous pannus always contains blood vessels and proceeds from the limbus between the epithelium and Bowman's membrane. Pannus is less frequent than neurodystrophy, and remains confined to the marginal zone of the cornea.

Under intense varieties of corneal degeneration, there is described an increase in the number of layers of the epithelium with or without elevation in the form of a bulla and a membranous formation within the epithelium.

H. D. Lamb.

Schmelzer, Hans. **Observations in the constitutional causes of glaucoma.** Graefe's Arch., 1938, v. 139, pt. 3, pp. 465-479.

Comparison of the blood chemistry in 55 cases of primary glaucoma as compared with that in 45 individuals of the same ages without glaucoma revealed that the cholesterine content was very much increased and the xanthoprotein reaction was positive in almost all the persons with glaucoma. It could be concluded therefore that a certain disturbance of the action of the liver was present in the cases of glaucoma. In addition to local therapy in the treatment of glaucoma, the author advises accordingly a diet low in fats and high in carbohydrates (much vegetable, salad, fruit, coarse bread, and fruit juices). H. D. Lamb.

Zamenhof, Adam. **Incision perpendicular to the surface of the globe in glaucoma operations.** Ann. d'Ocul., 1938, v. 175, Nov., pp. 846-853.

An ordinary Gillette razor blade in a special holder is used to make the ab externo incision for simple iridectomy or sclerecto-iridectomy for glaucoma.

John M. McLean.

9

CRYSTALLINE LENS

Case, P. H. **An interne's experiences with the Verhoeff method of cataract extraction.** Arch. of Ophth., 1938, v. 20, Oct., pp. 651-656.

The technique of the Verhoeff method is described and the advantages of the corneoscleroconjunctival suture presented. In the author's first series of 57 attempted intracapsular extractions, 51 lenses were removed in capsule. Loss of vitreous occurred in three of the cases in which the capsule was removed intact and in two of the six cases in which the capsule ruptured. The apparent causes of the rupture of the capsule were: poor coöperation of the patient, posterior synechiae which were not freed first, patient's youth, intumescent cataract, and high myopia. A brief report is given of the cases in which the capsule ruptured. J. Hewitt Judd.

Chandler, P. A. **Inferior iridotomy in operations for cataract on eyes with posterior synechiae or pupillary membrane.** Arch. of Ophth., 1938, v. 20, Oct., pp. 641-644; also Trans. Amer. Ophth. Soc., 1938, v. 36.

In order to insure a permanent pupillary opening in those eyes previously affected with iritis or cyclitis, or operated upon for glaucoma, an inferior iridotomy is recommended before the lens is removed. After the usual incision, any posterior synechiae are freed with a spatula, and the iris is split from the lower pupillary margin nearly down to the root with a Noyes scissors. This procedure has given adequate and permanent results in all but one of approximately twenty eyes. Even if the pupil closes no harm has been done. Two illustrative cases are reported in detail. J. Hewitt Judd.

Ciotola, Guido. **Two cases of double-rosette cataract.** Rassegna Ital. d'Ottal., 1938, v. 7, July-Aug., pp. 504-520. (See Section 16, Injuries.)

Cullom, M. M. **A new capsule grasping forceps.** Arch. of Ophth., 1938, v. 20, Oct., p. 1045.

This is a double-headed forceps designed to grasp the capsule at two points. There is a spread of 4 mm. between each pair of blades. The forceps are shown open and closed in photographs. (Note by editor: The second illustration seems to give a false idea of the relative position of the two pairs of blades.) J. Hewitt Judd.

Krause, A. C. **Chemical pathogenesis of cataract.** Amer. Jour. Ophth., 1938, v. 21, Dec., pp. 1343-1355.

Legrand, J. **Surgical treatment of dislocated lens in the vitreous.** Arch. d'Opht. etc., 1938, v. 2, Oct., p. 924.

Surgery of the luxated or subluxated lens has always been considered a serious and hazardous operation. The literature is most pessimistic, though many methods have been described, from the vectis or curette operation of Snellen and Pagenstecher to the transforming of a posterior luxation into an anterior one by pressure from behind, or using mydriasis and then placing the patient in a ventral position. There are practical objections to each of these methods, chief of which is the chance of glaucoma. That is why the author utilizes a small knife with interchangeable blades, constructed by Moria, for transfixion of the lens in the anterior chamber. As soon as this is accomplished the patient is turned on his back, and removal of the lens proceeds in the usual way. Two cases of luxated lens in which the instrument was successfully used are described.

Derrick Vail.

Olmos, E. S. **Combined cataract operation.** Anales Soc. Mexicana de Oft. etc., 1938, v. 12, Jan.-July, pp. 141-150.

The author's technique includes substitution of the Desmarres elevator for the lid speculum, a Kalt suture toward the nasal side, and a conjunctival flap toward the temporal side. (Discussion.)

W. H. Crisp.

Parker, F. C. **A cataract operation to reduce the incidence of prolapse of the iris.** Arch. of Ophth., 1938, v. 20, Oct., pp. 597-603.

The author objects to the usual manner of making the incision on the ground that it stretches the lower portion of the cornea and causes a greater tendency to prolapse of the iris. He suggests fixation above and an incision in which the heel of the knife is raised first, so that the tissues tend to be pushed inward. The next step is to raise the point end of the knife as it is being withdrawn. These motions are repeated until the incision is complete. The

points presented are shown by drawings. J. Hewitt Judd.

Samuels, Bernard. **Pathology of complicated cataract.** Southern Med. Jour., 1939, v. 32, Jan., p. 70.

The author discusses lens opacities occurring as a result of other lesions within the eyeball, such as inflammation, glaucoma, tumors, necrosis of surrounding tissues, and mechanical causes. He advises that a good general rule in the treatment of such cataracts is to wait at least one year after the eye becomes free of every sign of inflammation before operating, and then to use the extracapsular method following a preliminary iridectomy.

George A. Filmer.

Tupinamba, J., and Souza Dias, João de. **Marfan's syndrome with ectopia lentis.** Rev. de Oft. de São Paulo, 1938, 6th yr., April-June, pp. 61-66.

Beside subluxation of both lenses upward and to the right, the patient, a girl of eleven years, presented long slender build, muscular atrophy, dry and furrowed skin, and the long bones unduly long and slender. This combination the authors interpret as an abortive form of Marfan's syndrome. But the blood Wassermann was negative.

W. H. Crisp.

Wiederkehr, Willy. **Further contribution to senile exfoliation of the anterior capsule, based on slitlamp and histologic findings in 18 eyes from 14 patients between 60 and 104 years of age.** Graefe's Arch., 1938, v. 139, pt. 3, pp. 541-552.

The author confirms the three principal types of senile exfoliation of the anterior capsule as described by Vogt: lamina-like loosening of the superficial lamella, exfoliation with focal thinning of the capsule, and light flaky-like dissociation of the lamellae of the capsule. This senile exfoliation affects only the anterior capsule and predominantly the thick part near the anterior pole of the lens. H. D. Lamb.

Winkler, Adolf. **Contribution to the genesis of dermatogenic cataract.** Graefe's Arch., 1938, v. 139, pt. 3, pp. 526-531.

In a 27-year-old man with eczema, a predominantly anterior subcapsular cataract was present in each eye. The only anomalies of metabolism found were a metabolic indicanuria and elimination of loosely bound phenol.

H. D. Lamb.

10

RETINA AND VITREOUS

Bonnet, P. **Ophthalmoscopic after-effects, two years later, of a thrombosis of the inferior temporal vein.** Bull. Soc. d'Opht. de Paris, 1937, May, p. 344.

A light perivascular halo at the site of the previous thrombosis was all that could be found. The fields had become normal and vision had increased from 0.3 to 0.6 during the interval.

Harmon Brunner.

Burian, H. M. **The influence of the central nervous system on the pigment migration in the retina of the frog.** Amer. Jour. Ophth., 1939, v. 22, Jan., pp. 16-24.

Esser, A. A. M. **Schüller-Christian disease.** Schweiz. med. Woch., 1938, Aug. 27, p. 1014.

Esser reports a case that he has observed for three years in the pediatric clinic of the university in Basel. Because of changes found in the reticulo-

endothelial system, he believes that the condition is infectious.

Theodore M. Shapira.

Kalt, E., and Bailliart, P. **A case of juvenile degeneration of the macula.** Bull. Soc. d'Opht. de Paris, 1937, May, p. 309.

Careful description of the progress of a case in a male aged 34 years. The author discusses the etiology and regards the malady as a vascular insufficiency usually organic, but which may be functional. Harmon Brunner.

Keyes, J. E. L., and Goldblatt, H. **Experimental hypertension. 8. Vascular changes in the eyes.** Arch. of Ophth., 1938, v. 20, Nov., pp. 812-828. Trans. Sec. on Ophth., Amer. Med. Assoc., 1938, 89th mtg.

The eyes of dogs and monkeys with persistent hypertension following constriction of the main renal arteries have been observed for more than five years. The changes described, and illustrated by photomicrographs, are similar to those seen in man with benign and malignant essential hypertension. (Color plate of fundus changes, discussion.) J. Hewitt Judd.

McDonald, R., and Lippincott, S. W. **Angiomatosis retinae.** Arch. of Ophth., 1938, v. 20, Dec., pp. 958-965.

This condition was found in a boy aged fifteen years, in whom the disease had been present since the age of five years. The diagnosis was made in the left eye by ophthalmoscopic examination, and was confirmed by histologic examination of the blind right eye. The authors feel that the initial event is the formation of angioblastic derivatives, represented by cystic dilatations and capillaries, and that the gliosis is secondary. Secondary changes include exudation, hemorrhages, detachment of the retina, iridocyclitis, secondary glaucoma, cataract, and finally hypotension with phthisic changes. The tumor is shown to be of vascular origin, representing a congenital malformation, even though the gliosis is so marked that it nearly masks the true derivation of the tumor. (Photomicrographs.)

J. Hewitt Judd.

Magitot, A. **Recent and partial idiopathic detachment of the retina.** Ann. d'Ocul., 1938, v. 175, Nov., pp. 797-807.

A 35-year-old non-myopic patient had a detachment of the temporal side of the retina without associated trauma. Twenty days after it was discovered the eye was enucleated, and it was studied in serial sections. No tumor was found. There was a small disinsertion at the ora. There were no traction bands or abnormal proliferations in the vitreous.

On the attached as well as the detached side the pigment-epithelial cells showed hyaline production, pigment rarification, and alteration in form. Under the retina which had not become separated, an albuminous fluid was beginning to infiltrate between the choroid and the epithelial layer. All the pigment epithelium in this eye, including that of the iris, seemed to be undergoing pathologic changes. In the adherent side the retina itself appeared quite normal and showed none of the degenerative changes of the detached areas. The choroid was not hyperemic, sclerotic, or inflamed. The choriocapillaris, alone, showed small atrophic areas.

The author suggests that primary lesions of the pigment epithelium cause formation both of hyaline excrescences and albuminous subretinal fluid, and that a poorly understood disease of the

pigment epithelium may be the underlying factor in "idiopathic" detachment.

John M. McLean.

Matsuda, S. **The injurious action of hepatic and splenic toxins on the eye.** Graefe's Arch., 1938, v. 139, pt. 3, pp. 503-512.

Experiments with rabbits showed that toxins from the spleen exerted an injurious action upon the eye similar to that of hepatic toxins. This fact disproves a specific relation between the retina and the kidneys, and involves the conclusion that nephrotoxic material in man plays an essential factor in the production of albuminuric retinitis.

H. D. Lamb.

Measurement of the average width of retinal vessels and its meaning in differential diagnosis of hypertension and nephritis. Schweiz. med. Woch., 1938, Oct. 29, p. 1215.

The non-indicated author of this review states that according to the latest advances in the study of hypertension and nephritis, observations on the width of the arterioles are most essential. A new and accurate method to measure this has been found by Lobeck of Jena. Further, he states, the method is very quick and simple. Lobeck has had Zeiss make a measuring ocular which is attached to the Gullstrand ophthalmoscope. Instead of measuring the width of the retinal arterioles on the patient's retina, they are measured on the lens attached to the Gullstrand.

Theodore M. Shapira.

Nicholls, J. V. V. **The effect of section of the posterior ciliary arteries in the rabbit.** Brit. Jour. Ophth., 1938, v. 22, Nov., pp. 672-687.

This article represents a re-evaluation of the findings of Wagenmann some 45 years ago, Krückmann in 1899, and Capauner in 1893. Gonin, Nettleship, Greeves, and others, since 1902, have suggested that a choroidal vascular disturbance is the underlying cause of pigmentary degeneration of the retina. Wagenmann produced such degeneration by section of the posterior ciliary arteries. In the experiments now reported the Wagenmann technique was followed as closely as possible. Young adult rabbits were used, the twenty eyes operated on being for the most part pigmented. The method employed is fully described. Wagenmann's results in producing pigmentary degeneration of the retina by section of the posterior ciliary arteries are confirmed. Nevertheless, the results of the present experiments do not confirm the vascular theory of causation of retinitis pigmentosa, but, on the contrary, evidence was found against such a theory. (Illustrations, tables, references.)

D. F. Harbridge.

Orzalesi, F., and Cassuto, N. **Sympathol action on the pressure of the central artery of the retina.** Boll. d'Ocul., 1938, v. 17, April, pp. 270-278.

The chemistry of this synthetic product resembles that of adrenalin. Its pharmacodynamic action was tested in twelve patients by conjunctival instillation or by the hypodermic route, with the idea of learning its behavior on retinal arteries. The age of the patients, seven of them males, varied from 20 to 38 years. Sympathol provoked a lowering of retinal blood pressure which manifested itself ten minutes after the injection and reached its maximum after thirty minutes. After two hours the pressure had returned to the original level. In two of the cases no appreciable variations were noted. For instillation a ten-percent solution was

used, and the results were the same. In no case was an increase of pressure noted. In a case of intracranial hypertension the retinal pressure showed no variation. (Bibliography, 2 figures.)

Melchiore Lombardo.

Prado, D. L. do. **Thrombosis of the central retinal vein secondary to dental infection.** Rev. de Oft. de São Paulo, 1938, 6th yr., April-June, pp. 76-78. (See Amer. Jour. Ophth., 1938, v. 21, Nov., p. 1298.)

Rintelen, F. **Remarks on measurements of blood pressure in the retinal vessels.** Ophthalmologica (formerly Zeit. f. Augenh.), 1938, v. 96, Oct., p. 14.

Adequate local anesthesia is absolutely essential. Often pressure readings that are too high result from tangential application of the dynamometer because the partially anesthetized eye moves away from the instrument. Careful and deliberate application of the instrument is essential, and it is unnecessary to hurry to avoid changing the intraocular pressure by prolonged application of the dynamometer. Comparative measurements have demonstrated to the author that one may take five to ten seconds for the measurement without significantly modifying the readings. Too rapid a tempo does not allow accurate determination of Fritz's index; that is, the difference between the pressure that causes the first oscillation of the arterial wall and that producing complete collapse. It is of value in judging rigidity of the vessel wall.

Frequently a difference between the diastolic pressure in the right and left eyes is found and is of significance, but conclusions must never be drawn from this finding except when a tonometric reading has been combined with the dynamometric.

Measurements in tabetics did not disprove Sobonski's assertion that hypotony is the cause of tabetic optic atrophy. However, the author points out that hypotony cannot be the decisive factor or atrophy would be observed frequently in aortic insufficiency.

F. Herbert Haessler.

Schuck, C., and Miller, W. O. **Dark adaptation of the eye and vitamin-A storage in young adults.** Arch. of Internal Med., 1938, v. 61, June, p. 910.

On examination of 94 female freshman students between the ages of 17 and 22 years, poor dark adaptation was shown in 26.6 percent. Eighteen experimental subjects showed improvement under treatment with vitamin A. Some of the subjects failed to improve under vitamin F. Further studies on the action and uses of vitamin A are advised. Theodore M. Shapira.

Seidel, E. **A very rare retinal disease as partial manifestation of a general hereditary disorder.** Graefe's Arch., 1938, v. 139, pt. 3, pp. 520-525.

Tuberous sclerosis was diagnosed in the case of a fourteen-year-old girl with sluggish mentality and bilateral choked disc. In addition, in the fundus of the right eye, temporal to the optic papilla and about in the horizontal meridian, there were observed two cystic-appearing tumors, each in width about a disc diameter. In the fundus of the left eye, a similar swelling was present just above and temporal to the optic nerve. A reddish-brown slightly elevated spot the size of a pea was present in the forehead near the root of the nose. Similar spots were noted in the middle of the upper part of the left cheek, between the shoulder blades, under the

left scapula, under the left costal arch, and on the flexor surface of the thigh. In the skin of the cheeks were a great number of small, reddish, firm, warty growths of the size of the head of a pin, such as are known as sebaceous adenomata. H. D. Lamb.

Spaeth, E. B. **Etiology of retinal separation considered from the standpoint of surgical correction.** Arch. of Ophth., 1938, v. 20, Oct., pp. 1046-1070.

This ophthalmologic review includes discussion of history, etiology, retinal tears, mechanics of the formation of retinal tears, retinal separations from direct traumatism, myopia, inflammatory causes, symptomatic separation, and aphakia and retinal separation. The author concludes that the presence of a retinal tear or of a disinsertion is necessary to the development of retinal separation. J. Hewitt Judd.

Sugita, Yozo. **Further observations on the method of spontaneous retinal detachment, particularly the physicochemical factors in its origin.** Graefe's Arch., 1938, v. 139, pt. 3, pp. 561-586.

Physicochemical experiments confirm the author's contention that spontaneous retinal detachment is produced through an increase in osmotic concentration of the fluid vitreous. Water is thereby drawn from the retina, causing it to contract and leading to its detachment. The cleavage products in the fluid vitreous accumulate, according to the Gibbs-Thomson law, at the surface of the vitreous through positive adsorption. By accumulation of the cleavage products upward and temporally, due to centrifugation through movements of the eyeball, retinal tears are most commonly produced in these positions. H. D. Lamb.

Torres Estrada, Antonio. **Vitreous detachment.** Anales Soc. Mexicana de Oft. etc., 1938, v. 12, Jan.-July, pp. 151-161.

After eighteen years of blindness from bilateral iridocyclitis with pupillary seclusion, the left eye was operated upon for complicated cataract. After healing, an anterior detachment of the vitreous was found. The author emphasizes the fact that escape of vitreous during cataract extraction predisposes to vitreous detachment.

W. H. Crisp.

Weve, H. J. M., and Fischer, F. P. **The clinical value of proteolytic ferments in the subretinal fluid.** Ann. d'Ocul., 1938, v. 175, Nov., pp. 807-813.

The authors studied 118 cases of retinal detachment. In 87 percent the subretinal fluid did not contain appreciable quantities of proteolytic ferments which would attack fibrin. Increased proteolysis was present in fresh cases, cases tending to have complications, and cases of disinsertion with cyst formation. Increased proteolysis is not compatible with formation of rigid adhesions, but there is no definite correlation between proteolytic content of the subretinal fluid and the final operative result. The best prognosis is had when the proteolytic activity of the vitreous is normal, that is, just enough to prevent formation of vitreous bands without attacking the adhesive formations between the retina and choroid.

John M. McLean.

Weve, H. J. M., and Fischer, F. P. **Deterioration of albuminoid substances in the detached retina.** Ann. d'Ocul., 1938, v. 175, Nov., pp. 823-828.

The subretinal fluid contains not only ammonia but amines, derived from retina or choroid. In the detached retina

there is a deterioration of albuminoid substances. Since the oxygen consumption does not correspond to proteid combustion, the deterioration must be by proteolysis. This appears to be related to anatomic lesions in the retina, particularly the tear. Toxicity of the subretinal fluid seems to be due to substances which arise following the alteration in metabolism. The normal retina, which performs glycolysis far in excess of oxidation, presents neither albuminoid deterioration nor proteolysis. Thus it is seen that detachment, although curable, produces serious changes in the vital processes of the retina. John M. McLean.

Weve, H. J. M., and Fischer, F. P. **The importance of p_H in the proteolytic activity of the subretinal fluid and its inhibition.** Ann d'Ocul., 1938, v. 175, Nov., pp. 813-816.

The p_H of subretinal fluid falls with the duration of the detachment. There is no correlation between the proteolytic capacity of the subretinal fluid and its p_H, but there is a correlation between inhibition of proteolysis and p_H. As the p_H falls, proteolysis is increasingly inhibited, and this explains the decreased activity in old detachments.
John M. McLean.

Weve, H. J. M., and Fischer, F. P. **Metabolism of the detached retina.** Ann. d'Ocul., 1938, v. 175, Nov., pp. 817-823.

Normal retina in contact with its pigment epithelium has a very low oxidation-reduction potential (maximum of r_H 16 to 18). Detached retina is strongly oxidized (r_H 21 to 25.5). This oxidation is due to alteration in metabolism, with respiration, not glycolysis, predominating. Glycolysis is only possible when the retina is in contact with its pigment epithelium. Detachment interrupts contact, with consequent oxidation, inactivation of the glycolytic ferment, and loss of vision. Reattachment reverses this process.
John M. McLean.

Wynkoop, E. J., and Hadley, L. **Schüller-Christian's disease.** Arch. of Pediatrics, 1938, v. 55, July, p. 417.

The authors report a case in a child two years and nine months old, with the classical symptoms of bony defects in the skull, diabetes insipidus, and exophthalmos. The authors noted improvement in the condition when X-ray therapy and proper diet were used.
Theodore M. Shapira.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Carroll, F. D., and Goodhart, Robert. **Acute alcoholic amaurosis.** Arch. of Ophth., 1938, v. 20, Nov., pp. 797-803.

Four cases of total but temporary blindness associated with acute poisoning due to ethyl alcohol are reported. All were characterized by total blindness in both eyes, normal pupillary reaction to light and convergence, normal fundi, and rapid improvement after withdrawal of alcohol. The reasons for considering this disease as a manifestation of acute poisoning with ethyl alcohol are discussed, and evidence is presented to show that methyl-alcohol poisoning among addicts is of rare occurrence. Addiction is probably a prerequisite. Although infrequent, this disease demands correct etiologic diagnosis because of the excellent prognosis as compared with the poor prognosis in cases of blindness due to methyl-alcohol poisoning. J. Hewitt Judd.

Heim, H. **Therapy in tabetic optic atrophy.** Wiener med. woch., 1938, Nov. 12, p. 1196.

After a short review of the literature, the author tells of many cases in which after treatment with iodine there was no progress in the atrophy after many years.

Theodore M. Shapira.

Hill, T. R. **Some aspects of neuromyelitis optica.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 143.

A case report is given and conclusions from other cases are cited, to show that progressive bilateral retrobulbar neuritis is not uncommon in disseminated sclerosis. It is possible to find practically identical cases with all degrees of combination of signs and symptoms, between neuromyelitis optica and disseminated sclerosis. The author concludes that progressive bilateral retrobulbar neuritis is a special type of disseminated sclerosis, the "neuromyelitic type."

In discussion Gordon Holmes felt that classification should depend rather on the pathologic conditions underlying the cases, and that with this in mind the two conditions could be differentiated by modern cytopathologic methods. Beulah Cushman.

Kampmeier, R. H., and Jones, E. **Optic atrophy in pernicious anemia.** Amer. Jour. Med. Sciences, 1938, v. 195, May, p. 633.

The authors discuss three cases of pernicious anemia with optic atrophy. The diagnosis of tabes dorsalis had previously been made in two of the cases. The authors have decided that optic atrophy in pernicious anemia is an intrinsic degeneration rather than directly due to ischemia. Early recognition of visual disturbances in anemia is essential. Theodore M. Shapira.

Ridley, Harold. **Aplasia of the optic nerves.** Brit. Jour. Ophth., 1938, v. 22, Nov., pp. 669-671.

The rare condition reported herein occurred in an only child aged one year, observed in Rupert Scott's clinic at the Royal London Ophthalmic Hospital. The history shows no ocular defect in either paternal or maternal lines. No further defect, mental or otherwise, existed in the case, although such deformities have been noted in the few similar cases recorded. In the case here reported, while the pupils were inactive to light they varied in size unaided by stimulus. The media were clear, the fundi peculiar (illustrated), the red reflex pale with the choroidal pattern well marked. The eyes were quite normal as to anterior appearances. A deep excavation occupied the place of the optic disc, and from its base minute threads representing retinal vessels were all that emerged. A trace of blood, which faded out after leaving the edge of the excavation, was observed in the lower branch of the right eye only. This is stated to be the only case of its kind on record except one in a cat, in which only one eye was abnormal. (Illustrations, references.)

D. F. Harbridge.

Waldmann, Béla. **Parallel study of the pathogenesis of rhinogenous optic neuritis and of serous iritis.** Amer. Jour. Ophth., 1939, v. 22, Jan., pp. 44-53.

Wexler, D., and Last, M. **Coloboma of the optic nerve and of the macula; a microscopic study.** Arch. of Ophth., 1938, v. 20, Nov., pp. 787-796.

The authors review the literature and report the case of a woman aged 40

years in whom the right eye revealed a hypertensive retinitis and the left highly myopic eye presented a coloboma of the optic nerve. The eye was removed six hours after death from hypertensive and renal disease, and was sectioned serially. The anomaly was found to be essentially a coloboma of the nerve at its entrance, the nerve being replaced by rudimentary retinal tissue. Associated with this were persistence of remnants of the hyaloid system, widening of the scleral canal, dislocation of the lamina cribrosa, and a choroidal macular coloboma. While the presence of rudimentary nerve tissue may indicate ingrowth of primary retinal layers into the optic stalk, no microscopic explanation could be found for the relation of the undifferentiated nerve to the widening of the optic canal and distortion of the associated structures. J. Hewitt Judd.

Wolff, Eugene. **Some aspects of the anatomy of the optic nerve-head.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 70.

An interesting color plate of a section of the optic nerve-head, stained with Mallory's phosphomolybdic-acid and hematoxylin, shows the connective tissue formation of the posterior portion of the lamina cribrosa and the glial structure of the more anterior fibers. The "central connective-tissue sheath" and the intermediary tissue of Kuhnt are discussed, as well as the blood supply of the disc.

Beulah Cushman.

12

VISUAL TRACTS AND CENTERS

Aliquò-Mazzei, Alessandro. **Ocular manifestations in tumors of the cranial base of pharyngeal origin.** Boll. d'Ocul., 1938, v. 17, March, pp. 180-194.

A man of 51 years was affected by intense pain in the territory of the right trigeminus, internal deviation of the right eye from paralysis of the abducens, anesthesia of the cornea, and neuroparalytic keratitis of two months duration. The radiographic examination showed opacity of the sphenoid bone and disappearance of the foramen ovale. A woman of sixteen years showed the following symptoms: severe neuralgic pain in the territory of the left trigeminus nerve, total ptosis of the left upper lid, total ophthalmoplegia (chemosis, and central ulcer of the cornea with complete anesthesia of the cornea and of the territory of the first and second branches of the trigeminus. Radiographic examination showed slight opacity of the sphenoid with dilatation of the foramen ovale. There was atrophy of the optic disc. A woman of 47 years complained of acute pain of the left side of the face, ptosis of the left upper lid, paralysis of all the external muscles, and anesthesia of the first and second branches of the trigeminus. Radiographic examination showed deep erosion of the sphenoid bone. The writer discusses symptomatology, course, diagnosis, pathology, and therapy, the diagnosis lying in some cases between neoplasm and a basal meningitis of luetic or tuberculous origin. (Bibliography.)

Melchiore Lombardo.

Allen, T. D., and Carman, H. F., Jr. **Homonymous hemianopsic paracentral scotoma.** Arch. of Ophth., 1938, v. 20, Nov., pp. 846-849.

The literature is reviewed and the case of a woman aged 48 years presenting this condition is reported. This type of defect, not so rare as formerly believed, is characterized by sudden onset of a defect in the visual field in persons

otherwise healthy, complaints of difficulty with reading and fixation, normal ophthalmoscopic findings, unaltered visual acuity, and good prognosis as to visual acuity. The condition may be easily overlooked unless a careful history is obtained and perimetric examination made of the central fields.

J. Hewitt Judd.

Bujadoux. **Transitory reflex monocular blindness following artificial pneumothorax.** Bull. Soc. d'Opht. de Paris, 1937, May, p. 334.

There was loss of the superior field within thirty minutes and complete blindness in five days, with retention of consensual pupillary reflex. There were no fundus changes except slight pallor of the disc. The fields and vision slowly improved, so that two months later the only abnormality was a small paracentral scotoma. The possibility of a reflex retrobulbar angiospasm causing edema of the optic nerve is suggested. Harmon Brunner.

Kalt, Puech, and Kreba. **A case of optic chiasmal arachnoiditis following a contusion without wound in the region of the right upper lid.** Bull. Soc. d'Opht. de Paris, 1937, May, pp. 291-298.

An arachnoiditis of the chiasm which developed into a serous meningitis. Vision in the right eye was affected within 24 hours; after three months it was reduced to 0.2. An intermittent absolute scotoma and an absolute paracentral scotoma which later became constant developed in the right eye. Four months after onset, vision in the left eye fell to 0.2 with a relative central scotoma, symmetric with that of the right eye, giving bitemporal paracentral scotoma. Surgery gave prompt improvement in vision. One year from onset the only sequelae were a small paracentral absolute scotoma in each field and a relative central scotoma in the right eye, reducing vision to 0.4. Prompt surgical intervention is stressed. Harmon Brunner.

Lemoine, A. N. **Lesion of the optic tract, probably the result of infected sphenoid sinuses.** Arch. of Ophth., 1938, v. 20, Dec., pp. 966-973., also Trans. Amer. Ophth. Soc., 1938, v. 36.

A man aged 39 years had developed hypertrophy of the prostate at the age of 33 years, and impotency at the age of 37 years. Administration of anterior pituitary extract was followed by improvement, but a lesion of the right optic tract developed and progressed to complete loss of central vision in 21 days. The vision was temporarily improved by the use of ephedrine in the nose. After the sphenoid-sinus disease was corrected by operation, the vision and field rapidly improved to normal. At operation the right sphenoid sinus, which was anomalous in that it extended into the posterior clinoid process back of the optic chiasm, was found to have a hemorrhagic area on the posterior wall. Its close proximity to or possible contact with the superior portion of the right optic tract was thought responsible for the retrobulbar neuritis at this point.

J. Hewitt Judd.

13

EYEBALL AND ORBIT

Brain, W. R. **Neurological and general medical causes of exophthalmos.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 27.

The causes of exophthalmos are reviewed.

Cashell, G. T. W. **Case of proptosis due to carcinoma of the antrum.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 48.

A case report is given from a series of eighteen cases, four of which had carcinoma of the antrum. It is concluded that in this group proptosis meant involvement of the ethmoid cells, secondary to orbital cellulitis, and that the prognosis was good if radium therapy was instituted early, but bad if proptosis was present.

Beulah Cushman.

Cawthorne, Terence. **Ear, nose, and throat aspects of the differential diagnosis of the causes of exophthalmos.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 19.

Pathologic conditions of the ear, nose, and throat may produce exophthalmos either by causing increase in the orbital contents or by reducing the size of the orbit. The latter may occur either from foreign material being forced into the orbit, from interference with venous return, from extension of inflammation, or from invasion by new growth. Final diagnosis must always be greatly influenced by the radiographic report. Beulah Cushman.

Doggart, J. H. **Differential diagnosis of proptosis in children.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 32.

The eye and orbit at birth and during childhood being smaller relatively than in the adult, proptosis appears earlier, and the eye itself is more distensible. Increased contents of the orbit will cause prominence, as increased size of the eye in myopia, buphthalmia, or cystic tumors. Inflammatory exudates or hemorrhages from injury or blood dyscrasias may cause prominence. Tumors involving the orbit or its contents are not uncommon in children. Graves's disease is very uncommon but does occur. Weakened support of the eyeball may be a factor, or diminution of orbital volume as in oxycephaly.

Beulah Cushman.

Ellison, J. **Arteriovenous aneurysm.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 43.

Three cases are reported. In the first, arising out of a motorcycle accident, ligation of the internal carotid stopped pulsation and bruit, but the eye later showed retinal hemorrhages of thrombotic origin. In the second case, a tine of a pitchfork had passed between the eyeball and the orbital wall. Ligation of the internal carotid produced relative recovery, although the bruit could still be heard on auscultation. In the third case, due to a fall from a bicycle, the aneurysm ruptured, and the patient died after artificial respiration had been maintained for many hours following ligature of the common carotoid.

Beulah Cushman.

Griffith, A. D. **Pulsating exophthalmos after injury.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p.41.

In 20,000 admissions to the surgical wards of Westminster Hospital two cases of pulsating exophthalmos after head injury were included. One case report followed a motorcycle accident in which multiple fractures occurred including fracture of the base of the skull. After temporary ligation of the left internal carotid, pulsation of the eyes ceased at once and the exophthalmos began to recede. The artery was ligated permanently three days later, and the patient recovered.

Beulah Cushman.

Hayes, W. M. **Collapse of glass eyes.** Industrial Med., 1938, v. 7, Dec., p. 734.

The author reviews the literature and reports a case. He shows that the eye collapses and does not explode, and that it is the posterior, concave portion that gives way.

George A. Filmer.

Knapp, Arnold. **Orbital hyperostosis; its occurrence in two cases of meningioma of the skull.** Arch. of Ophth., 1938, v. 20, Dec., pp. 996-1005. also Trans. Amer. Ophth. Soc., 1938, v. 36.

The literature is reviewed with special reference to tumors of the sphenoid ridge and tumors of the sylvian cleft. In the first case reported there was unilateral bony deformity with exophthalmos, no changes in the optic nerve in the early stage, and slight paresis of the external rectus muscle. The meningioma involved the squamous portion of the temporal bone, the large wing of the sphenoid bone, and the outer and upper walls of the orbit. The eye was enucleated and as much as possible of the mass in the orbital cavity was removed. After nearly two years the bony swelling measured about 8 by 6 by 4 mm. The pain was relieved entirely by roentgen treatment. In the second case the meningioma apparently originated at the temporal half of the fissure of Sylvius and involved the greater wing of the sphenoid bone and the temporal part of the lesser wing, extending to the anterolateral part of the frontal and the anterior part of the temporal bone. The patient was given roentgen treatment and the process remained stationary. Whether this was due to the roentgen treatment could not be determined. (Photomicrographs.) J. Hewitt Judd.

MacCallan, A. F. **Differential diagnosis of the causes of exophthalmos.** Trans. Ophth. Soc. United Kingdom. 1938, v. 58, pt. 1, p. 50.

By the use of pathologic distinctions the author considers acute inflammatory exophthalmos under the headings of simple orbital edema, orbital subperiosteal abscess, and orbital cellulitis. Beulah Cushman.

Moore, R. F. **Differential diagnosis of causes of exophthalmos.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 3.

The author analyzed 117 consecutive cases of proptosis as to bilaterality, direction of proptosis, palpation of orbital contents, limitation of movements, chemosis, traumatic causes, callus formation, hemorrhage into the orbital cavity, inflammatory causes, Graves's disease, dermoid cysts, benign tumors, tumors of the optic nerve and its sheath, primary malignant growths, metastatic growths, arteriovenous aneurysms, thrombosis in the cavernous sinus, and the proptosis of oxycephaly. Beulah Cushman.

Pochin, E. E. **Lid-retraction and exophthalmos in Graves's disease.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 39.

In comparing the apparent exophthalmos of Graves's disease with proptosis the author found that retraction of the upper lid was frequently present without exophthalmos and the lower lid stood at a slightly higher level relative to the cornea before prominence could be measured. In one case this was true for a year before the exophthalmos could be measured. In other cases of Graves's disease there was no lid retraction but a measurable exophthalmos. Thus the author concludes that

exophthalmos and lid retraction in Graves's disease give an illusion of exophthalmos. Both widen the palpebral fissure, exophthalmos widening it downward and exposing sclera below the cornea, while lid retraction widens it upward, exposing sclera above the cornea. Beulah Cushman.

Rushton, R. H. **The clinical measurement of the axial length of the living eye.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 136.

The author used the shadow cast by a metal object between an X-ray tube and the eye, because such a shadow is visible in the dark with the closed eye after dark adaptation. The principle is to find the distance between retinal X-ray perception at the posterior pole and a ribbon of light passing tangentially to the cornea in a plane exactly parallel with that at the posterior pole. A suitable piece of apparatus was demonstrated.

Beulah Cushman.

Whiting, M. H. **Orbital meningoencephalocele.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 58.

Anterior encephaloceles emerge between the ethmoid and frontal bones at the expense of the horizontal plate of the ethmoid. In the orbit they pass between the frontal process of the frontal bone, the lacrimal bone, the cribriform plate of the ethmoid, and the nasal process of the superior maxilla. Posterior encephaloceles emerge between the sphenoid and the frontal bone on either side of the lesser wing of the sphenoid. Parsons' classification of cysts of the orbit is given. He calls encephalocele an inclusion cyst of congenital origin.

A number of case reports are included. Operative interference terminated fatally in a number of instances, from subsequent meningitis. The presence of pulsation transmitted from the cranial cavity, and the occurrence of pressure symptoms such as restlessness, vomiting, and slowing of the pulse on compression of the tumor, are given as the clearest indications of the nature of an encephalocele.

Beulah Cushman.

Wolfe, C. T. **Congenital bilateral anophthalmos.** Kentucky Med. Jour., 1938, v. 36, July, p. 279.

Wolfe presents a case of this rare anomaly in a nine-year-old child. Etiology and history did not suggest a reasonable cause.

Theodore M. Shapira.

14

EYELIDS AND LACRIMAL APPARATUS

Cornet, Emmanuel, **Dacryocystorhinectomy (a new technique).** Ann d'Ocul. 1938, v. 175, Nov., pp. 842-845.

The operation follows the Dupuy-Dutemps technique until the nasal mucous membrane is exposed. Then a large window is cut out of the mucosa and a corresponding window from the side of the lacrimal sac. The edges are joined with two continuous catgut sutures forming a circular anastomosis. The nasolacrimal duct is curetted and the skin and canthal ligament are closed in the usual manner.

John M. McLean.

Focosi, M. **Malformations from persistence of the oblique fissure of the face.** Boll. d'Ocul., 1938, v. 17, April, pp. 255-269.

A girl of sixteen years showed an anomaly of the left side of the face. The internal canthus was about 7 mm.

lower than the right one. The palpebral fissure, instead of being horizontal, was oblique. There was ectropion of the margin of the lid in its nasal portion, with eversion of the lacrimal punctum. There was also a deepening of the nose-chin line, and the left ala nasi appeared to be 1.5 cm. higher than the right. Etiology and pathogenesis are discussed, and plastic surgery for the condition is described. (Bibliography, 5 figures.) Melchiore Lombardo.

Fonseca, Aureliano. **The Marcus-Gunn syndrome.** Rev. de Oft. de São Paulo, 1938, 6th yr., April-June, pp. 92-100.

Description of a case of jaw-winking, with discussion of its anatomic basis. W. H. Crisp.

Guy, Loren. **Simple dacryocystorhinostomy.** Arch. of Ophth., 1938, v. 20, Dec., pp. 954-957.

The incision is made from a point 3 mm. above the inner canthal ligament downward and outward, just nasal to the anterior lacrimal crest, and is carried down to the bone through the periorbita. The latter is then elevated temporally, exposing the lacrimal fossa and the sac. In the lower half of the fossa a window about 4 by 6 mm. is made by means of a chisel, a pair of scissors, or a curette. The nasal mucous membrane and the corresponding portion of the sac wall are excised, the tissues allowed to fall back into their natural position, and held in place by a pressure bandage. No sutures are used. Of the 54 patients operated on by this method, fifty were relieved both of epiphora and of empyema of the sac. One failure was due to faulty technique and one resulted from nasal obstruction due to neglected sinus disease. J. Hewitt Judd.

Michail, D., Vancea, P., and Zolog, N. **Investigations on the lacrimal elimination of glucose.** Bull. de l'Acad. de Méd. de Roumanie, 1938, v. 5, no. 2, p. 182.

Glucose is not normally eliminated in the tears, but is found in the tears of diabetics, and during the course of alimentary and adrenalin hyperglycemia. In the former two conditions, there is no relation between the amount of glucose excreted and the blood-sugar level, while the contrary seems to be true in the latter condition. George A. Filmer.

Nicholls, J. V. V. **A case of granuloma of the lacrimal canaliculus.** Canadian Med. Assoc. Jour., 1938, v. 39, p. 569.

A pea-sized tumor surrounding the upper canaliculus in a 60-year-old woman was removed and studied pathologically. Because of its microscopic appearance and the presence of some old conjunctival scars, the lesion was assumed to be of a trachomatous nature. (Illustration.) George A. Filmer.

Rabinowicz, M. G. **Chronic bilateral dacryoadenitis.** Viestnik Opht., 1938, v. 13, pt. 1, p. 112.

In a woman of nineteen years, enlargement of the lacrimal glands was associated with enlargement of the thyroid. The diagnosis was made by biopsy. The tissue was excised from the lids, with complete recovery. Ray K. Daily.

Raverdino, Emilio. **A turbinotome for dacryocystorhinostomy "ab externo."** Rassegna Ital. d'Ottal., 1938, v. 7, July-Aug., pp. 499-503.

The author describes an instrument for biting off a portion of the turbinate

in the external operation of dacryocystorhinostomy. It is a forceps, curved in a slight S-shape, its ends cup-shaped, 7 by 4 mm. The edges are only slightly sharpened. The plane of the spoon-shaped end of the instrument is parallel to the plane of the handles. The author finds numerous uses for the instrument in the operation mentioned. (3 figures.)

Eugene M. Blake.

Smith, J. W. **Blepharitis comb.** Arch. of Ophth., 1938, v. 20, Oct., pp. 658.

For removing the densely adherent scales in ulcerative blepharitis a comb has been devised which consists of eight metallic needles 3 mm. long, covering a width of 3 mm.

J. Hewitt Judd.

Thurel, Robert. **The motor disturbances of the lids.** Arch. d'Opht. etc., 1938, v. 2, Sept., p. 795, and Oct., p. 897.

After discussing the physiology of the lid movements the pathology of lid motility is gone into at great length. The various headings and subheadings are: paralysis of the orbicularis (of peripheral and central origin), paralysis of the levator, hypertonic retraction of the upper lid, involuntary movements, and blepharospasm (of peripheral and central origin). The article does not lend itself to abstracting.

Derrick Vail.

Tomkevich, A. I. **Late results of external dacryocystorhinostomy.** Viestnik Opht., 1938, v. 13, pt. 3, p. 388.

A review of the literature and an analysis of the author's own material, which consisted of 414 operations, with 96.14 percent final satisfactory results. In the author's experience recurrences appear within the first few months after the operation, and he urges that patients be kept under observation for six months.

Ray K. Daily.

Valière-Vialeix. **Additional cases of chronic conjunctivitis provoked by mycelian infections in the lacrimal canaliculi.** Bull. Soc. d'Opht. de Paris, 1937, May, p. 298.

Reports of two proved cases which presented as chronic monocular conjunctivitis. The author gives the characteristic symptoms as: conjunctivitis predominating at the inner canthus, with folliculosis in chronic cases; abundant stringy conjunctival secretion; and itching at the inner angle. The canaliculi could be irrigated. The cases were resistant to conjunctival medication. The treatment is careful curettage after incision of the canaliculus.

Harmon Brunner.

White, J. P., Michaelson, I. C., and Heggie, J. F. **Tumor of lacrimal sac of cellular mixed parotid type, associated later with tumor of parotid region of same histological character.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 159.

A mass in the region of the left lacrimal sac, which had increased in size after sixteen years, was removed. The growth was hard and fibrous, but no disease of the bone or other structures was noted. A course of deep X-ray therapy was given. Four months later a swelling was found at the upper pole of the parotid, and because of enlargement it was removed two months later. Histologically the tumors were similar. Each had a thin capsule and was moderately vascular. The intimate relation of stroma and cells characteristic of mixed parotid tumors was observed in both tumors.

Beulah Cushman.

15
TUMORS

Angius, Tullio. **Lymphangioma of the limbus.** Rassegna Ital. d'Ottal., 1938, v. 7, July-Aug., pp. 538-542.

The author reviews our knowledge of this rare tumor of the eye. Many believe it is congenital, for it often increases rapidly at puberty. Trauma may play a part. He reports an instance of the condition in a man of 63 years. One year before Angius saw the patient a small growth had appeared at the limbus of the right eye. After eight months this was removed but no study was made of it. The growth recurred within four months and increased rapidly. Microscopic study showed a collection of oval spaces, lined by endothelium and separated by connective tissue septa. There was some infiltration by polynucleated cells. Fibroblasts were found in the septal positions. The growth raised the corneal epithelium but did not invade Bowman's membrane. (2 figures.)

Eugene M. Blake.

Bietti, Giambattista. **Precocious choroidal metastases of latent primary carcinomas and their diagnostic problems.** Boll. d'Ocul., 1938, v. 17, March, pp. 163-179.

A man of 65 years had an intraocular tumor which upon microscopic examination was found to be carcinoma. The same symptoms developed in the other eye a year later. A woman of 32 years was affected by symptoms of intraocular tumor of the left eye, which was found to be a carcinoma of the choroid. The same symptoms manifested themselves in the other eye, which was found to contain the same type of tumor. Both these patients passed away with abdominal symptoms. In both cases the two eyes became affected by a tumor which appeared to be metastatic, and before the metastases the patients had not noticed any subjective general disturbances, nor did the clinical and laboratory examinations reveal the localization of the original focus of the neoplasm. The diagnostic difficulties are discussed. (Bibliography, 6 figures.)

Melchiore Lombardo.

Braun, Reinhard. **Chaoul's concentrated-fractional roentgen near-radiation of malignant tumors of the lids.** Klin. M. f. Augenh., 1938, v. 100, Oct., p. 557.

Chaoul's method combines the advantages of application of radium with those of soft roentgen rays. Eleven cases are reported, three unfavorable. Good results are obtained with sufficient dosage. The danger from radiation is reduced if a nickel-plated lead prothesis is used for protection of the healthy surroundings.

C. Zimmermann.

Braun-Vallon. **A case of optic-nerve tumor.** Bull. Soc. d'Opht. de Paris, 1937, May, pp. 287-290.

A three-year-old child had deviation of the right globe downward, exophthalmos, and unilateral papilledema, with roentgen signs of enlargement of the optic foramen. Exploration revealed an encapsulated tumor encircling the optic nerve. This was resected, leaving the globe. The pathologic diagnosis was meningoblastoma, type sarcomatous with involvement of the optic nerve. It is considered as a slowly progressive benign growth rarely involving cranial portions of the optic nerve.

Harmon Brunner.

Dupuy-Dutemps. **Tumor of the choroid. Liver metastasis eight years**

after enucleation. Bull. Soc. d'Opht. de Paris, 1937, May, p. 284.

Case report of a 33-year-old male whose left eye was enucleated for melanosarcoma of the choroid. Invasion of the sclera but no perforation was found on microscopic examination. Observation over five years showed no local or general return. Two photomicrographs compare sections of the primary and metastatic tumors. Another case is cited with metastasis nine years after enucleation.

Harmon Brunner.

Herman, P. **Melanotic sarcoma of iris associated with congenital anomaly.** Bull. Soc. d.Opht. de Paris, 1937, no. 3, March, p. 164.

Report of a case of melanoma occurring in a heterochromic iris on a large, presumably congenital ectopia. (2 photomicrographs, pathologic report.)

Harmon Brunner.

Keller, P. **Glioma of the retina at Tonkin, thirteen observations histologically confirmed.** Arch. d'Opht. etc., 1938, v. 2, Sept., p. 813.

Various statistics give the frequency of retinal glioma as 6.8 per 100,000, 17 per 100,000, 10 per 100,000. The author reports a frequency at Tonkin of 26 per 100,000, 23 percent of the cases being bilateral. Of the thirteen cases reported, in six the tumor had broken through the eyeball and fungated externally between the lids. Five showed ocular hypertension of rapid evolution, generally present at the end of two months after the condition was first recognized. Enucleation or evisceration was performed in all except two of the cases. After the stage of hypertension is reached radiation treatment does not work. None of the cases gave a history of heredity. (Illustrations.)

Derrick Vail.

Lijo Pavia, J. **The formation of retinal folds by pressure on the globe from an orbital tumor.** Rev. Oto-Neuro-Oft., 1938, v. 13, May, p. 122. (See Amer. Jour. Ophth., 1938, v. 21, Sept., p. 1068.)

Radnot, Magda. **Carcinoma of the meibomian glands.** Ophthalmologica (formerly Zeit. f. Augenh.), 1938, v. 96, Oct., p. 22.

In a 59-year-old man, a resistant thickening of the lid occurred and gradually increased in size in the course of seven months. Histologically it proved to be a medullary carcinoma. Tumors of the meibomian gland are very rare and are more often adenoma than carcinoma. The rare carcinoma may be very malignant, and may recur, metastasize, and cause death.

F. Herbert Haessler.

Rosenbaum, H. D. **Sarcoma of the iris.** Amer. Jour. Ophth., 1938, v. 21, Dec., pp. 1360-1364.

Sédan, Jean. **Recurrence of epithelioma of the limbus, with large independent palpebral and corneal attachments.** Ann. d'Ocul., 1938, v. 175, Nov., pp. 829-836.

Ten years ago an epithelioma of the limbus and adjacent cornea had been excised but not irradiated. Eight years later a similar mass arose from the palpebral conjunctiva, and later it bridged across to become attached at the site of the former tumor on the cornea. The two attachments were entirely independent, for a probe could be passed under the tumor mass between these two areas. Excision was again practised.

John M. McLean.

Sgrosso, S. **Diagnosis of metastatic carcinoma of the eye.** Rassegna Ital. d'Ottal., 1938, v. 7, July-Aug., pp. 439-498.

The author describes minutely four cases of metastatic carcinoma of the eye, in two of which there were bilateral manifestations. A third case was monocular and the fourth was probably localized in the optic nerve behind the globe. The ages of three patients were between 50 and 60, while one was only 38 years old.

The literature is carefully reviewed and the different phases of the subject fully discussed. The author found 258 cases reported, 70 percent of which were in females. The age most frequently affected is between 50 and 60 years. The tumor reaches the eye through the blood stream and lodges in the choroid. Approximately 25 percent of the cases are bilateral, and when both eyes are affected there is usually only a short interval of time between them. Metastasis in the eye occurs anywhere from one to two years after the primary growth is discovered. The first symptom is usually loss of vision or defect in the visual field. Commonly the ocular growth is in the posterior portion, usually near the disc and more often on the temporal side. The tumor is flat and ovoid at first, the color yellowish gray. The tension is not raised except late in the disease. In differential diagnosis one must consider simple detachment, sarcoma, and irritative glaucoma. (5 colored figures.)

Eugene M. Blake.

Shepkalova, V. M. **Diktyoma of the retina.** Viestnik Opht., 1938, v. 13, pt. 1, p. 95.

Clinical and histopathologic report of a case in an eight-year-old girl. This malignant tumor arises from embryonic retina. Histologically it is differentiated from glioma by its mitoses, which are placed on the free surface of the cellular layer, away from connective tissue and blood vessels. In glioma the mitoses are located basally. Ray K. Daily.

Torres Estrada, A. **Dermoid cyst of the orbit penetrating to the anterior cerebral fossa.** Anales de la Soc. Mexicana de Oft., etc. 1937, Oct., Nov., and Dec., pp. 105-108.

The patient was a woman of 62 years. Since the first years of her life she had had a small induration between the upper orbital margin and the left eye, toward the outer end of the eyebrow. The growth had increased in size since the age of 45 years. The eyeball was greatly displaced forward, downward, and inward. Puncture of the tumor showed a thick yellowish oily liquid, without suppuration. After incision above the eyebrow and separation of the ocular tissues from the orbit, the growth was found to be of the size of a small orange. The roof of the orbit had undergone destruction, and the growth had penetrated into the anterior cerebral fossa, pushing before it the dura mater. After evacuation of the fluid, the sac was dissected out. The eyeball returned to its normal position. W. H. Crisp.

16

INJURIES

Berezinskaja, D. I. **The rôle of paracentesis in the treatment of chemical ocular burns.** Viestnik Opht., 1938, v. 13, pt. 3, p. 361.

A report of a laboratory study on rabbits. The conclusions are that repeated paracentesis is helpful in moderately severe alkali burns, and in severe corneal burns provided the conjunctiva was not destroyed. In necrosis of the conjunctiva paracentesis is helpful only in conjunction with mucous-membrane transplantation. Ray K. Daily.

Bonnet and Bonamour. **An unusual case of cataract caused by electrocution.** Bull. Soc. d'Opht. de Paris, 1937, May, p. 333.

Three months afterward, the patient had a superficial anterior cortical cataract of the left eye with vision of 0.5. Six months later a posterior cortical cataract developed and reduced vision to 0.02. The need for guarded prognosis in these cases is stressed.

Harmon Brunner.

Ciotola, Guido. **Two cases of double rosette cataract.** Rassegna Ital. d'Ottal., 1938, v. 7, July-Aug., pp. 504-520.

The author cites two cases of rosette cataract, which were unusual in that the rosettes were doubled; that is there was an anterior subcapsular rosette-shaped opacity and also a similar one in the posterior subcapsular region. Both cases occurred in young men and resulted from rather severe contusions. The development of the opacities is explained as forming about the original Y-shaped figures, with extensions to bundles of fibers attached to the sutures. In all about 150 such cases have been described. The literature is reviewed and cases abstracted. (4 figures.)

Eugene M. Blake.

Denig, Rudolph. **Indications for immediate transplantation of buccal mucous membrane for eye burns.** Med. Record, 1938, v. 148, Dec. 7, p. 395.

Immediate surgical treatment of the majority of eye burns by mucous-membrane transplantation is urged by the author. He shows that burns, even if some distance removed from the cornea, may damage the capillaries of the limbus and interfere with the nutrition of the cornea. Excision of limbal conjunctiva with transplantation of buccal mucous membrane results in formation of new capillaries, hyperemia, and increased diffusion of nutritive material into the corneal tissue. (Illustrations.)

George A. Filmer.

Disler, H. H. **Rosette-shaped traumatic cataract.** Viestnik Opht., 1938, v. 1, p. 5.

From a study of traumatic opacities, the course of which is recorded by drawings, the author divides the lenticular traumatic manifestations into immediate, secondary, and late. The primary changes are associated with injury to the lens capsule and lens substance, appear at the site of injury, and consist in destruction of lens fibers and edema. They may be arrested at any point of their development and may regress to some extent. The pathogenesis of secondary lenticular changes is less clear. They are usually in the form of rosette-shaped cataracts which may completely regress. Late opacities may appear months after the injury and usually proceed to complete opacification. The author's group of opacities, appearing after injuries not involving the lens, are characterized by their persistence. Five posterior ring-like opacities and one anterior-capsular opacity showed no change during a period of observation extending over several months. Two cases with posterior and anterior subcapsular opacities were practically without change for three weeks. In none of these cases was there a rosette-shaped opacity.

Ray K. Daily.

Dollfus, M., and Borsotti, I. **Experimental study of tolerance to intraocular foreign bodies of rustless steel or non-magnetic alloys.** Arch. d'Opht. etc., 1938, v. 2, Oct., p. 911.

From their clinical and experimental observations the authors reach the fol-

lowing conclusions: (1) The presence of an oxidizable metal, iron, steel, or copper, within the eye provokes by its chemical nature a severe disorder which leads to rapid loss of vision and irremediable retinal lesions. (2) Rustless steel, on the contrary, more and more employed in industry, is tolerated like any other inert chemical body, such as glass, within the eye. Siderosis does not result. (3) Every effort must be made therefore to determine the nature of the intraocular metal before operating. If it is rustless steel or non-magnetic alloy it is wiser to refrain from attempting extraction, because experience has shown that the eye supports the foreign body without damage. Such a foreign body is only dangerous by carrying infection or by traumatic lesions it may have provoked. (Illustrations, bibliography.) Derrick Vail.

Filippov, H. A. **Electromagnetic service.** Viestnik Opht., 1938, v. 13, pt. 2, p. 276.

The author urges mass production of giant and hand electromagnets for the purpose of equipping all ocular dispensaries with them. Ray K. Daily.

Goldberg, H. K. **Iodism with severe ocular involvement.** Amer. Jour. Ophth., 1939, v. 22, Jan., pp. 65-68.

Hartmann, Karl. **The question of ocular lesions from sulphuretted hydrogen.** Klin. M. f. Augenh., 1938, v. 101, Oct., p. 510.

Numerous reports show that sulphuretted hydrogen damages the corneal epithelium primarily (not by the way of the blood and respiration), causing a superficial punctate keratitis, with complete recovery after a few days. As deviating from this, the author has previously described a case of typical keratitis with complete loss of sensibility, a combination not hitherto mentioned in the literature. A similar observation was made by Kiel in a caisson worker, with subsequent scars of the cornea and vision 8/10 after several months. Experiments in rabbits proved that 0.1 per 1000 of sulphuretted hydrogen might after prolonged action produce superficial and also deep keratitis. In the numerous cases of acute and subacute poisoning by sulphuretted hydrogen described in the literature, ocular affections are never mentioned. Such a case of severe acute poisoning without ocular involvement is now presented. C. Zimmermann.

Jacqueau and Dumas. **Subconjunctival hemorrhage from strangulation.** Bull. Soc. d'Opht. de Paris, 1937, May, p. 341.

Strangled by a neckerchief caught in transmission gears, the patient suffered no immediate aftereffects. Twenty-four hours later he developed a tremendous ecchymosis of the entire conjunctiva, a moderate ecchymosis beneath the surrounding skin, and slight exophthalmos. The reason for delay in development of the hemorrhage is discussed. Harmon Brunner.

Kalt, M. E. **The harmful action on the retinal pigment epithelium of certain solutions containing iodides and injected parenterally.** Bull. Soc. d'Opht. de Paris, 1937, May, p. 304.

Following reports of pigmentary degeneration from massive parenteral injections of fortified Pregl's solution (Septoid), the author reports a series of animal experiments. Believing sodium iodate ($NaIO_3$) to be the active agent, he injected a 4-percent solution into gray rabbits and produced, as injections were continued, retinal edema

and pigment spots of different forms and degrees. Histologic sections showed pigment cells invading the retina, and greater dosage caused retinal and choroidal degeneration. No other ocular lesions were observed. (5 illustrations, 4 references.)

Harmon Brunner.

Kaplan, I. D., and Lapidus, A. M. **Occupational acrichinin keratitis.** Viestnik Opht., 1938, v. 13, pt. 3, p. 409.

Workers in factories producing this product develop, in addition to symptoms of general intoxication, a keratitis characterized by edema, erosions, and a greenish-yellow discoloration of the cornea. Relief from the subjective symptoms is rapid, but the discoloration and corneal dullness may remain for two months. Ray K. Daily.

Kochkongov, M. I. **A serous cyst of the iris.** Viestnik Opht., 1938, v. 13, pt. 2, p. 268.

A report of a case which developed fifteen years after an injury.

Ray K. Daily.

Kolen, A. A., and Triumfov, A. V. **A rare case of hysteria.** Viestnik Opht., 1938, v. 13, pt. 1, p. 38.

After a fall from a moving train a woman had paralysis of the third and sixth nerves. Soon afterward she developed severe pain in the left eye, relieved only by pressure on the eyeball. On release of pressure the pain extended over the entire head and the patient became ataxic. When the patient again presented herself at the hospital two years later, the left eye was in a state of enophthalmos, atrophy, and hypotony. With constant pressure over the left eye the patient had no complaints, but release of pressure brought on severe pain and ataxia. The patient begged to have the left eye enucleated, and recovered promptly after the operation. The author considers the patient's difficulties hysterical, and attributes the hypotony, enophthalmos, and atrophy of the left eye to the prolonged continuous pressure. Ray K. Daily.

Lijo Pavia, J. **Traumatic hole at the macula and detachment of the vitreous.** Rev. Oto-Neuro-Oft., 1938, v. 13, p. 154.

A thirteen-year-old boy sustained a macular hole from a blow on the eye. The foveal lesion was first noticed one month after the injury. Six months after the injury the author noted detachment of the vitreous between disc and fovea. The evolution of both macular and vitreous changes is described in great detail. A discussion of macular holes and the factors which may produce them is appended. (Illustrations.)

Edward P. Burch.

McAlester, A. W., III. **Gonioscopy as an aid to localizing small foreign bodies in the anterior chamber.** Amer. Jour. Ophth., 1938, v. 21, Dec., p. 1380.

McDonald, Robb. **Carbon disulphide poisoning.** Arch. of Ophth., 1938, v. 20, Nov., pp. 839-845.

The author reviews the literature and presents the results of his studies of 120 workers employed in a rayon industry where they had been exposed to carbon disulphide for a long time. Many showed systemic signs of chronic intoxication, and 75 percent of those examined had some ocular complaint. The most significant early ocular sign was enlargement of the blind spot. Diminution of the corneal reflex was found in over one half of the workers. Diminution of the pupillary reaction to light was the second most common finding. The ocular signs of carbon-

disulphide poisoning are essentially those of a systemic neurologic disturbance. No cases of rayon keratitis were seen. J. Hewitt Judd.

Makhlin, I. M. **Injury to the eye from eyebrow and eyelash dyes.** Viestnik Opht., 1938, v. 13, pt. 2, p. 271.

A report of three cases, two of which were promptly cured by irradiation with Bucky's border rays. The author urges supervision of beauty parlors and of the sale of the dyes.
Ray K. Daily.

Plitas, P. S. **Occupational ocular injury with a bobbin from a weaving machine.** Viestnik Opht., 1938, v. 13, pt. 3, p. 412.

A blow on the eye by a bobbin flung from a weaving machine is among the most serious occupational injuries. It should be entirely eliminated by industrial prophylaxis. Within the last four years the author has seen thirteen such injuries, in nine of which the eyes were finally enucleated. The vision of the four cases in which the eyeballs were saved was 0.7, 0.1, 0.02, and 0.001 respectively. Ray K. Daily.

Teulières, M., and Beauvieux, J. **Post-traumatic pearl cyst of the iris.** Arch. d'Opht. etc., 1938, v. 2, Aug., p. 706.

As a rule traumatic penetration of a cilium into the anterior or posterior chamber leads to a severe inflammatory reaction. Occasionally, however, the cilium may be well tolerated and after a long time become encysted, resulting in so-called "pearl cyst" of the iris. A case is described in which such a cyst developed within a year after a perforating steel injury and retention of a cilium in the anterior chamber. The rapid evolution is explained by proliferation of the ectodermal cells of the ciliary bulb, or by corneal cells being drawn into the anterior chamber at the time of the accident. (Illustrations, bibliography.) Derrick Vail.

Tichvinskii, B. T. **The use of egg membrane in plastic operations on the eyeball.** Viestnik Opht., 1938, v. 13, pt. 3, p. 397.

The author uses eggshell membrane to prevent development of symblepharon in chemical burns and in recurrent pterygium. He emphasizes the importance of suturing the membrane in the desired place. Ray D. Daily.

Woschke, Joachim. **Retinal detachment and accident.** Klin. M. f. Augenh., 1938, v. 101, Oct., p. 587.

Accidental detachment may occur after perforating injuries, from formation of holes and tears in the retina, from intense loss of vitreous and later inflammation followed by formation of cyclitic pseudomembranes, even long after the injuries. It may also occur after direct contusion of the eyeball if a tear of the retina is produced, or after indirect contusion of the globe by impact on the skull or whole body (by formation of retinal tears). Another cause is excessive bodily exertion.
C. Zimmermann.

17

SYSTEMIC DISEASES AND PARASITES

Brückner, A. **Physiologic and clinical ophthalmologic problems in relation to individual variability.** Arch. of Ophth., 1938, v. 20, Oct., pp. 541-568; Nov., pp. 726-756; and Dec., pp. 913-953.

The reactions of different individuals to normal and abnormal stimulii vary within a wide range. The individual variability is based on the constitution as determined by heredity. Persons with extreme degrees of insufficiency

are able to exist at low intensities of light only with the protection which human civilization affords. The author reviews the theories of color sense and discusses the dependence of color sensation on the stimulus. Recent findings support the hypothesis of Hering that the peripheral nerve endings respond to stimulation by the production of chemical substances of antagonistic character, acetylcholine and epinephrine.

Congenital color deficiencies are discussed under the topics of partial color blindness, anomalous trichromates, diagnosis and frequency of different types of color deficiency, heredity of color deficiency, total color blindness, and the development of color sense. The phenomena of local adaptation are discussed with reference to the phenomena of revulsive local adaptation, including black sensation and the importance of contrast; local differences in adaptation, especially as to measurement of this phenomena; the phenomenon of constancy; and the seat of local adaptation.

The third section discusses normal and pathologic light and dark adaptations and variation in the relative thresholds, the various factors causing individual variation, and the diseases accompanied by disturbances of dark adaptation. The individual variabilities found by clinical methods are discussed under the headings of focal illumination, tonometry, and sensitiveness of the cornea. Under diseases of the eye dependent on constitution, the author discusses tuberculous diseases of the eye and scrofula of the eye. The diseases of the eye discussed in relation to weather and climate are hordeolum, catarrhal ulcer of the cornea, acute conjunctivitis, herpes corneae, scrofula of the eye, and acute glaucoma.

J. Hewitt Judd.

Caramazza, F. **Experimental tuberculosis of the eyeball from inoculation with attenuated bacilli of human tuberculosis.** Boll. d'Ocul., 1938, v. 17, March, pp. 133-152.

The author injected into the anterior chamber of one eye and the vitreous of the other eye of four rabbits an emulsion of human tubercle bacilli in different concentration. One rabbit was injected in one eye with tubercle bacilli while the other eye had been inoculated some time before with the aqueous of another rabbit affected by active tuberculosis. The inoculation in the anterior chamber was followed by no reaction at the beginning, and the presence of tuberculous formations in the iris and ciliary body was noted as a late manifestation. The inoculation in the vitreous was followed by a slight diffuse inflammatory process, with foci of exudate between choroid and retina and later in the anterior uveal tract. At a still later stage the specific character was lost. This is taken as a demonstration of the natural tendency to exhaustion of the tuberculous process due to the action of the natural powers of defense. The rabbit which was inoculated with tubercle bacilli while the other eye was affected by a tuberculous process showed Koch's phenomenon, namely, the development of an acute reaction leading to panophthalmitis. (Bibliography, 11 figures.)

Melchiore Lombardo.

Chesney, A. M., Woods, A. C., and Campbell, A. D. **Observations on the relation of the eye to immunity in experimental syphilis.** Jour. Exper. Med., 1939, v. 69, Jan. 1, p. 163.

It is known that second inoculations of homologous strains of Treponema pallidum made after the ninetieth day following the original infection are not

followed by a secondary infection, an acquired resistance having apparently been set up. In this investigation, syphilitic rabbits were allowed time to develop an acquired immunity, as shown by the fact that one control group failed to develop lesions following intracutaneous injection of infective material. Injections into the cornea or anterior chamber, however, resulted in lesions in 62 percent of the animals tested, although showing a longer incubation period than in control animals. The authors conclude that in the syphilitic rabbit the eye does not participate to the same extent as other tissues in the general resistance which develops during the course of the infection. (Illustrations.)

George A. Filmer.

Elles, N. B. **Bilateral accommodation paralysis and unilateral scotoma in sphenoidal-sinus disease.** Amer. Jour. Ophth., 1938, v. 21, Dec., pp. 1365-1369.

Hoshi, K. **The influence of some toxins producing ocular changes on the morphologic blood-picture in rabbits.** Graefe's Arch., 1938, v. 139, pt. 3, pp. 553-560.

Curves are presented to show the effect on the number of red blood cells and the number with polychromasia in each of five or six rabbits after intravenous injection of nephrotoxin, hepatotoxin, and septojod, respectively.

H. D. Lamb.

Jones, L. T., Jordan, L. W., and Sullivan, N. P. **Intraocular nematode worms.** Arch. of Ophth., 1938, v. 20, Dec., pp. 1006-1012.

The authors review the literature and report a case in which the living adult form of a nematode, measuring about 9 mm. in length and 0.2 mm. in diameter, was found attached to the iris of a patient who had never been in a tropical country. The worm was lost at the time of removal and an exact classification could not be made. The appearance of the eye is shown in a drawing.

J. Hewitt Judd.

Rosenzweig, M. G. **Cysticercus in the subcutaneous tissues of the orbit.** Viestnik Opht., 1938, v. 13, pt. 2, p. 270.

The parasite was found in a cyst excised from the orbit. Ray K. Daily.

Savin, L. H. **Remarks on ophthalmic gout.** Trans. Ophth. Soc. United Kingdom, 1938, v. 58, pt. 1, p. 149.

After a historical review of ocular lesions associated with the diagnosis of gout, four case reports are given. The following points are emphasized in diagnosis of the gouty diathesis: a history of acute attacks, including some history of provocative factors; family history; the presence of tophi; increase of blood uric-acid in attacks; lessened excretion of uric acid in the urine; X-ray evidence of typical punched-out areas in the bones of an affected joint; and the response to treatment with colchicum. Beulah Cushman.

Shapiro, E. A. **Treatment of ocular complications of malaria with iodoquinopyrin and novocaine blocking.** Viestnik Opht., 1938, v. 13, pt. 1, p. 107.

A review of the clinical material thus treated demonstrates the effectiveness of this therapeutic combination.

Ray K. Daily.

Walsh, F. B. **Facial hemiatrophy.** Amer. Jour. Ophth., 1939, v. 22, Jan., pp. 1-10.

18

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Alvaro, M. E. **Prophylaxis and care of blindness.** Reprint from Arquivos de

Clin. Oft. e Oto-Rino-Laring., 1937, 4th year.

This thorough review of the subject, apparently presented to the second Brazilian Congress of Ophthalmology, deals with the steps taken in all the important countries of the world, summarizes the statistics available as to the incidence of blindness (varying from 3.7 per 10,000 in Belgium to 166.7 per 10,000 in Palestine), and closes with a bibliography of 136 references.

W. H. Crisp.

Alvaro, M. E. **Scientific organization of ophthalmologic work.** Rev. de Oft. de São Paulo, 1938, 6th yr., April-June, pp. 79-91.

The organization of clinical work is discussed, with special mention and illustration of a double chair (both parts adjustable as to height) for doctor and patient in the work of refraction.

W. H. Crisp.

Alvaro, M. E. **Twentieth International Congress of Ophthalmology.** Rev. Oto-Neuro-Oft., 1938, v. 13, Jan., pp. 3-9.

A brief commentary on the Cairo Congress.

Bab, W. S. **Blindness passed unobserved for many years.** Jour. Nervous and Mental Dis., 1938, v. 88, Sept., pp. 327-329.

The author reports the case of a 21-year-old idiot who, he believes, had been blind for many years from an optic atrophy without the parents or the attendants observing the fact.

T. E. Sanders.

Bazshenova, M. A. **Tissue culture of animal ocular structures.** Viestnik Opht., 1938, v. 13, pt. 3, p. 355.

A review of the literature and a report of the author's own investigations on the eyes of adult rabbits. She found that the ocular tissue of the adult rabbit grows as well in vitro as tissues of the embryo and the new-born.

Ray K. Daily.

Best, Harry. **The problem of statistics relating to blindness and the blind.** Amer. Jour. Ophth., 1938, v. 21, Dec., pp. 1376-1379.

Borges Dias, Artur. **Ocular examinations in aviation candidates.** Rev. de Oft. de São Paulo, 1938, 6th yr., April-June, pp. 67-75.

A statement of the necessary tests, in Portuguese.

Denig, E. P. **Considerations on the present diffusion of trachoma in Cordoba.** Arch. de Oft. de Buenos Aires, 1938, v. 13, April, p. 182.

The article consists chiefly of a statistical analysis. The author reaches the conclusion that about 2.7 percent of the population of the province are affected, but that the disease is decreasing in incidence. Edward P. Burch.

Esser, A. M. **Ascetic self-blinding.** Klin. M. f. Augenh., 1938, v. 101, Oct., p. 580.

Quotations from the legends of ascetic self-inflicted destruction of the eyes in Christian and Indian cultures show common traits, while absence of this psychologic phenomenon in antiquity illustrates the difference of mentality of these groups.

C. Zimmermann.

Ferree, C. E., and Rand, G. **Prescribing light. An important factor in the care and treatment of the eye.** Brit. Jour. Ophth., 1938, v. 22, Nov., pp. 641-668.

It is the opinion of the authors that, in comparison with other branches of medicine, the use and progress of hygienic measures in the care and treatment of the eye have been overlooked to the point of undue neglect. The subject of hygiene is therefore dealt with in this lengthy article (not lending itself well to abstract) under the following headings: important structural and functional conditions, outstanding features in lighting in relation to examination and care of the eye, means for improving lighting conditions, examination of the eye in relation to lighting, intensity of light and strength of reading glasses. The prescribing of light to meet the needs of individual persons is now a practical possibility, and it is the feeling of the authors that, when properly used, such practice will be of definite service. (References.)

D. F. Harbridge.

Friedenwald, Harry. **The services of the Jews to ophthalmology.** Acta. Ophth. Orientalia, 1938, v. 1, Sept., pp. 36-48.

This is a comprehensive review of the part played by Jewish physicians in the field of ophthalmology since the Arabic period. Many familiar names of workers of the middle ages and of recent centuries are briefly referred to. The history of modern ophthalmology in Europe includes the names of Hirschberg, Magnus, Stilling, Axenfeld, Bernheimer, Salzmann, Hirschmann, Laqueur, and Javal. Among prominent American Jewish ophthalmologists may be mentioned Hays of Philadelphia, Gruening of New York, and Koller (discoverer of the anesthetic properties of cocaine).

W. H. Crisp.

Gorovaja, K. G., and Rappaport, M. K. **Ocular findings in the military candidates of 1914-1916 in the Minsk district.** Viestnik Opht., 1938, v. 13, pt. 3, p. 333.

The report shows a yearly decline in the incidence of trachoma and ocular injuries. Ray K. Daily.

Levy and Bailliart. **Trembling of field glasses.** Bull. Soc. d'Opht. de Paris, 1937, no. 3, March, p. 177.

There is a normal, constant, and physiologic tremor which may become accentuated in various states of muscle tension. This limits the magnification useful in hand-supported glasses.

Harmon Brunner.

Rakusen, C. P. **History of Chinese spectacles.** Chinese Med Jour. 1938, v. 53, April, pp. 379-390.

The history of the use of glass and spectacles in China is reviewed. The author concludes that, although there is good evidence that the Chinese made use of glass as early as 200 B.C. and that the use of rock crystal goes back to prehistoric times, the history of the use of spectacles in China is still obscure and it is possible that spectacles may have been introduced into China rather than developed there.

T. E. Sanders.

Row, D. H., and Chadwick, C. D. **Causes of blindness in Indiana.** Amer. Jour. Ophth., 1939, v. 22, Jan., pp. 57-64.

Vila Ortiz. **Necessity of regulating the visual efficiency of transportation employees, and the medicolegal evaluation of industrial eye accidents.** Arch. de Oft. de Buenos Aires, 1938, v. 13, April, p. 195.

The author makes a plea for the establishment by governmental decree of visual standards for individuals engaged as drivers in transportation services, including operators of motor vehicles and airplanes. He gives in tabular form the standards proposed for the various categories. He stresses the fact that defects considered unimportant in other lines may be of considerable importance in drivers of vehicles. Edward P. Burch.

NEWS ITEMS

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News items should reach the Editor by the twelfth of the month

Deaths

Dr. Anton Schwartz Schneider, Plattsburg, New York, died November 19, 1938, aged 48 years.

Dr. Benjamin Franklin Baer, Jr., Philadelphia, died December 19, 1938, aged 59 years.

Dr. Oscar Merle Shirey, Cleveland, Ohio, died November 20, 1938, aged 60 years.

Miscellaneous

Approximately 15 percent of all blindness can be traced to syphilis, says the National Society for the Prevention of Blindness in a statement urging widespread public observance of National Social Hygiene Day on Wednesday, February 1.

"The venereal diseases—syphilis and gonorrhea—are among the major destroyers of sight," the statement points out. "For that reason, we have a special interest in the efforts to control these diseases, and we are glad to coöperate with the campaign sponsored by the American Social Hygiene Association.

"The importance of this problem may be realized from the fact that about 60,000 babies are born with congenital syphilis every year. Most of them develop a serious eye condition at some time in early life, unless they receive adequate medical care.

"Prenatal syphilis is preventable if the expectant mother who is infected begins treatment in the early months of pregnancy. The Society advocates a routine blood test for every expectant mother, because such a test can usually determine the presence of syphilitic germs.

"The compulsory use of prophylactic drops in the eyes of all babies at birth has brought about a marked reduction in the amount of blindness from gonorrheal infections; and a great decrease in the amount of blindness from prenatal syphilis can be achieved also.

"In industry, too, the eye hazards are greater when workers are suffering from syphilis. The presence of this disease increases the severity of eye injuries; a little cut or bruise of the cornea, that would otherwise pass unnoticed, may develop into a serious condition if the worker is suffering from syphilis.

"The consequent lowering of sight to a point of economic blindness carries with it the full indemnity for complete loss of vision; and the courts have held that the existence of syphilis does not lessen the responsibility of the insurance carrier unless it can be definitely shown that the loss of sight would have progressed even if the injury had not occurred."

The National Society for the Prevention of Blindness has announced that Lewis H. Carris, managing director, assumed the title of general director on January 1, with Mrs. Winifred Hathaway as associate director. Mrs. Eleanor Brown Merrill, an associate director for the past five years and formerly secretary of the Society, becomes executive director, and will relieve Mr. Carris of administrative details. John M. Glenn, one of the founders of the National Society for the Prevention of Blindness, has been elected an honorary vice-president.

The Department of Ophthalmology at the University of California, a year ago, received the sum of $40,000 for the establishment of the Charles Taylor Reeve Foundation in Ophthalmology. Just recently, with Mrs. Reeve's death, an additional $30,000 has been added to this fund. The interest from this combined fund is for the study and treatment of diseases of the eye.

The Seventeenth Annual Summer Graduate Course in Ophthalmology and Otolaryngology, Denver, Colorado, is announced for July 24 to August 5, 1939. The Denver Graduate Course, pioneer of its kind in the country, was originally conceived to supply a two-fold need of instruction and summer recreation. This year it is intended to make the work even

more attractive by bringing a larger number of guest instructors and adding evening lectures to the curriculum. The evening lectures will be delivered by prominent and qualified leaders in the allied specialties, who will bring the latest information in their fields as it relates to ophthalmology and otolaryngology. For further information write Dr. Harry L. Whitaker, 1234 Republic Building, Denver, Colorado.

Mr. L. Vernon Cargill, November, 1938, opened the reconstituted pathological and research department of the Royal Eye Hospital. The foundation of the department 50 years previously was pointed out, and the good work done there. The new extension will increase the possibilities of the department.

Societies

The Ophthalmological Society of the United Kingdom will convene at the Royal Society of Medicine on April 20, 21, 22, 1939. The subject for discussion will be "The problems of refraction." The Bowman Lecture will be delivered by Professor Weve on "Diathermy in ophthalmic practice." The International Organization against Trachoma and the International Association for the Prevention of Blindness will hold their annual meetings on April 19, 1939.

The Puget Sound Academy of Ophthalmology and Otolaryngology announces the following officers: Dr. J. Edward Clark of Seattle, president; Dr. W. A. Cameron of Tacoma, vice-president; Dr. Purman Dorman of Seattle, secretary-treasurer.

The Eye Section of the Philadelphia County Medical Society, presented the following program on February 2, 1939: Sarcoma of stump of the iris eight years after iridectomy with cataract extraction, by Dr. Maxwell Herman; Iritis due to gout, by Dr. Jacob Reber; Mirror writing in school children, by Dr. M. E. Smukler. Discussions were given by Dr. Samuel Bruck and Dr. Samuel J. Goldberg.

Personals

Miss E. E. Cass has been appointed Hon. Ophthalmic Surgeon to the New Sussex Hospital for Women and Children at Brighton, while Mr. Joseph Minton has been elected Assistant Ophthalmic Surgeon to the West End Hospital for Nervous Diseases.

At a dinner meeting of the Cleveland Ophthalmological Club, held November 1, 1938, the guest speaker was Dr. Ramon Castroviejo of New York City. Dr. Castroviejo gave a most instructive and illuminating talk on "Plastic surgery of the cornea." The lecture was illustrated with beautiful lantern slides and moving pictures.

Dr. Gilbert Patterson of Santa Rosa, California, announces the removal of his office to 1116 Mendocino Avenue.

Dr. Hans Barkan of San Francisco has recently returned from a four months' trip abroad. A good deal of his time was spent in Switzerland, where he made some interesting observations.

Dr. Otto Barkan of San Francisco has recently returned from an extended trip abroad, most of his time having been spent in the Scandinavian countries.